

# TPM Volume-15

## Total Preventive Maintenance

### *Cost reduction-3 & Consultancy Job*

2021a Edition

Koichi Kimura



Factory Management Institute

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## Icons:



Notes: Going and Comeback to the main theme.



The third level of the Issue, in order to provide more clearness to the structure of the text.



Lower levels of the Issue, commonly 6<sup>th</sup> or 7<sup>th</sup> And, pointing out necessary explanations about pictures or graphs.

## UPDATING TABLE:

Date, Version-Previous & V-Next	Chapter (I..XX...)	Chapter Point.- sub-point : (Updating)

# I. Introduction

## What the secret is for succeeding a consultancy

I'm believing 3 essential matters. These are: Firstly to find out the customer's true wish. Secondly, to evaluate the current situation with a numerical value. And thirdly, to unite as company-wide.

### To find the customer's true wish.

I have a bitter experience which was my first failure as a consultant in the manufacturing industry. I was asked my consultancy by a company. The request was to introduce a Kanban System in the company. And, Kanban System was one of my specialties. Consequently, when making the contract, the company required a quick result and only introduced a model line. After a simple investigation about the production, the model line was made very successfully. But one year later, when I visited the company, the model line was completely disappeared. Of course, the expansion of the Kanban System wasn't implemented. I felt very deep discouragement.

What was wrong?... Firstly, I didn't make effort to find the true wishes of the client.

This Teaching Company lecture was also the same. He required me just introduction of JIPM's TPM and didn't tell the true wish which was "Profit Recovery". Generally, a company that asks for a consultant has poor conception ability. Indeed, to elicit true wishes from the client is the first important task.

### To evaluate the current situation.

To share the same recognition about the company's current situation in numerical evaluation. Therefore, when starting a consultancy, I and the client use the factory management checklist<sup>1</sup> and evaluate visibly.

### Company-wide activity.

In fact, it is difficult to implement right away. Because a company-wide is the most difficult item of the three ones. Therefore, I use the tools, which are 5Ss & committee activity by **Gemba**, deepen the corporate policy in total, management team organizing & system introduction (data gather & utilization & feedback). And one of the essential matters is the nurture of "Employees Engagement". This Teaching Company required me to help them for the profit recovery by cost reduction. And my first suggestion was not to implement "Cost reduction", but **Muda** reduction. Secondly, I suggested introducing the system of monthly factory review meetings with proper materials. And, as one of the essential, I recommended my style P/L Statement to identify the effect and effort.

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<sup>1</sup> Factory Management Checklist ENG/SP:

[https://archive.org/details/factorymanagementchecklistespeng\\_202001](https://archive.org/details/factorymanagementchecklistespeng_202001)

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## II. Cost Reduction

In Cost reduction-2, I wrote “What is Cost?”, and also wrote that Cost has various faces with through the case of Teaching Company. Cost is a very important factor to manage a company.

Cost, nothing is as vague as the word cost. Because the calculation result is changeable depending upon the calculation method.

I classified Direct cost and Indirect cost and Allocation. (From TPM-14<sup>2</sup>)

<b>Cost Classification</b>		<b>Material</b>	<b>Labour</b>	<b>Expense</b>
		Cost of goods consumed to manufacture the product	Personel cost for employees involved in manufacturing such as direct work, indirect work, and back office.	Cost of Outside of Material & Labour
<b>Direct</b>	Clearly recognized ammount consumed for particular product.	Raw material and Purchased parts	Consumption wages for direct working hours in which direct workers to be involved in the manufacturing	Outsourcing Air, Gas, Water, Utility, Electricity.
<b>Indirect</b>	Unclear consumption for each product	Auxiliary material cost: Paints, dyes, fuel cost for manufacturing machinery, Factory consumable cost, the consumable cost in the production process, machine oil, consumable tools & fixtures, spare parts that are outside of fixed assets.	All other than the above are classified as indirect labour costs: Welfare, Bonus, Allowance, Provision for retirement benefits, etc. Wages for supervisors, line leaders, inspectors, material handlers, shipping or receiving clerks, maintenance technician.	Welfare facility, Rental, Insurance, Depreciation, Patent.

Now, to deepen the understanding of cost, I introduce the P/L Statement of my division of the previous company. And, this Teaching Company also used a similar system to my previous company.

Let's look at it (Example is better than precept.).

My previous company produces a vehicle's wiring harness. And, it is a typical labor-intensive industry. (Refer Making stream of production-13. **Kanban** System<sup>3</sup>)

Then, this P/L Statement is used not only for just P/L but also for investigating the direct costs performance (labor and material cost).

<sup>2</sup> TPM-14 Clasificación de Cost & Oiling: <https://archive.org/details/tpm-14-clasification-of-cost-and-oiling>  
 TPM-14 Clasificación de los Costes y la Lubricación 4: <https://archive.org/details/tpm-14-control-de-la-lubricacion-4>

<sup>3</sup> Making stream of production-13 & 14. Kanban System:  
[https://archive.org/details/makingstreamofproduction13\\_202001](https://archive.org/details/makingstreamofproduction13_202001)  
 Estableciendo la Corriente de Proucción 13 & 14, El Sistema Kanban:  
[https://archive.org/details/establecerlacorrientedeproduccion13\\_202001](https://archive.org/details/establecerlacorrientedeproduccion13_202001)

Let's look at this P/L Statement form one by one according to the number and classification.

Classification	Subjects	Remarks	Note
Planned Direct Cost	1 Sales amount & Sales KMH(Kilo Standard Hours)		Actual amount & sales products x Standard H/P
	2 Planned Labour Cost		$\Sigma \text{Product Sold} \times \text{SH} \times \text{Standard Unit Labour Cost}$
	3 Planned Material Cost		$\Sigma \text{Material Used in Sold} \times \text{Planned Material (Standard) Cost}$
Direct Cost Modification	4 <b>Planned Marginal Profit</b>	4=1-(2+3)	Marginal Profit=Sales amount-Variable cost
	5 Actual Labour cost		Actual working hours x Planned unit cost ÷ Achieved Efficiency Same to 2.
	6 Planned Labour Cost		
	7 <b>Labour Cost Modification</b> (Labour Efficiency. Planned & Actual%. Repair Cost Quality Defect Ratio, Actual & Plan of Production KMH )	7=5-2	Actual result of material cost. Same to 3. the part of material cost. Actual material scrap loss.
	8 Actual Material Cost		
	9 Planned Material Cost		
	10 Loss on disposal of waste (Loss rate. Planned & Actual %)		
	11 <b>Material Cost Modification</b>	11=8-3	
	12 <b>Direct Cost Modification Total</b>	12=7+11	
	13 Outsourcing Cost		Treated as Direct Cost and Variable Cost
	(Outsourcing, Planned & Actual KMH)		
	14 <b>Actual Marginal Profit</b>	14=4-12-13	
Actual Other Cost	15 Direct Expenses		Other than Outsourcing (Metal mold, Tools, etc.)
	16 Factory (Manufacturing) Overhead		Indirect Material, Indirect Labour and other Indirect Expenses (Machine & Equipment Depreciation)
	17 <b>Gross Profit</b>	17=14-(15+16)	
	18 Selling Expenses		Sales commission, sales promotion cost (advertising cost)
	19 General and administrative expense		Personnel costs (salaries, bonuses, various allowances) for indirect departments, costs for operating the office of indirect departments etc.)
	20 <b>Operating Profit</b>	20=17-(18+19)	
	21 Non-Operating Income		
	22 Non-Operating expense		
	23 <b>Ordinary Profit</b>	23=20+21-22	
	24 Extraordinary Income or Loss		
	25 Tax		
	26 <b>Net Profit</b>	26=23-24-25	

## 1. Sales amount and Sales KMH (Kilo Man Hour; Kilo Standard Hours) (1)

**Sales amount:** Actual Sales Amount of the month.

**Sales KMH:**  $\text{Sales KMH} = \sum \text{Product Sold} \times \text{Standard Hour}$

Standard Hour (SH) is a very important tool. And, it is used for factory management such as work distribution & personnel placement and planning & actual personnel resources, machine & equipment, material procurement, production, sales, profit, department unit cost, scrap & loss control, improvement.

The standard hour is an index that unifies and evaluated such above items. And, it is never an overstatement that SH is one of an essential tool for factory management.

## Planned Direct Cost

The contents are: Planned Direct Labour Cost and Planned Material Cost (2 and 3).

My previous company does monthly Closing of Accounts, quarterly, half-year, and annual accounting.

Here, I explain the case of monthly closing of accounts which is used for factory management. It is compared **Actual** Sales Amount and **Planned** Direct Cost.

## 2. Planned Labour Cost (2)

$$\text{Planned Direct Cost} = \sum \text{Product Sold} \times SH \times \text{Planned Unit Labour Cost}$$

$$\begin{aligned} \text{Planned Unit Labour Cost (Hour)} &= \\ &= \frac{\text{Total Labour Cost}}{\text{Total Production KMH}} \times \text{Planned Efficiency Improvement} \end{aligned}$$

**Total Labour Cost:** Last year's expended result

**Total Production KMH:** Last year's  $\Sigma$  Products produced x SH

**Planned Efficiency:** Planned in Annual Profit Plan. For instance, 10% improvement. It is the meaning of 10% cost cut down.

It is the Actual Result of Last Year.

Now, please remember the next 2 things.

- As an above formula, it is the multiplication of Actual (product sold) and Planned (unit cost), despite the title to be Planned Direct Cost. It is the evaluation of Planned Cost to the Actual Sales Amount.
- Products Sold. It is not the same as Actual production kinds, and a lot of the month, and they are delivered from inventory.

My company implements **Kanban System** between our delivery center and Toyota production line. (See Making stream of production-13 **Kanban System**<sup>4</sup>). And, the Inventory Turnover Ratio including raw materials and parts was 24 turns which means less than one day of stock. Therefore, this month's production (actually the last month) and this month's sales amount (also the last month) is the same timing products. But the case of a company that takes the "Make to Stock" style and is bad Inventory Turnover Ratio is not matched on the monthly base timing of production against sales.

**Planned Labour cost:** Treat it as a variable expense.

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<sup>4</sup> Making stream of production-13 & 14. Kanban System:

[https://archive.org/details/makingstreamofproduction13\\_202001](https://archive.org/details/makingstreamofproduction13_202001)

Estableciendo la Corriente de Producción 13 & 14, El Sistema Kanban:

[https://archive.org/details/establecerlacorrientedeproduccion13\\_202001](https://archive.org/details/establecerlacorrientedeproduccion13_202001)

And, probably, you may have a doubt... Labor cost should be a fixed cost. And strictly, excluding overtime work which has the characteristic of variable cost. But this P/L statement which I used in my previous department SUMITOMO treats labor cost as a variable cost.

It is Planned. In where?... It is planned in the annual profit plan.

I explain the reason in Direct Cost Modification. But now and shortly, in Direct Cost Modification, it is compared the difference between actual cost and planned cost (Actual - Planned). And it is calculated as:

$$\begin{aligned} & \text{Actual Sales Amount} - \text{Planned Direct Cost} \\ & \quad - \\ & \quad (\text{Actual Direct Cost} - \text{Planned Direct Cost}) \\ & \quad = \\ & (\text{Actual Sales Amount} - \text{Actual Direct Cost}) \end{aligned}$$

(Actual Sales Amount - Actual Direct Cost) show the **Marginal Profit**.

**Direct Labour Cost:** Firstly, what labor cost is: Labour cost is Salary, Welfare expenses, legal welfare expenses, Severance pay, Officer, and Compensation. And, Direct Labour Cost is the Labour Cost of the above to pay to just Direct Workers.

I need to explain the method of Annual Profit Planning someday. But here, it is investigated the usage of planned labor (and planned material cost) cost against sales amount.



#### ***Severance pay and welfare expense. Japanese case.***

*Severance pay is taken from the system of Allowance for Retirement Pay system.*

*Welfare expenses are a general term for expenses paid by a company for welfare. Welfare expenses include expenses for club activities and employee trips for employee comfort, ceremonial occasion expenses such as marriage/childbirth congratulatory money and condolence money, and company housing expenses.*

*Among them, the expenses that companies are obliged to bear under the law are called statutory welfare expenses. The company will pay part or all of the social insurance costs such as health insurance, welfare annuity insurance, long-term care insurance, and labor insurance costs such as workers' accident insurance and employment insurance.*

### **3. Planned Material Cost (3).**

$$\text{Planned Material Cost} = \sum \text{Material Used in Selling} \times \text{Planned Material Cost}$$

This is the material cost that was used in actual sales. And, as you understand, many kinds of materials are expended in a factory. And it is necessary to classify Direct and Indirect for factory management accounting.

Direct material cost is easy, isn't it?... I rather prefer to omit the explanation.

Indirect material cost is the manufacturing costs, which are materials that are indirectly or supplementary consumed in the manufacture of products, and consist of auxiliary material costs, factory consumables costs, and consumable tool equipment costs. Specifically, auxiliary material costs include fuel, oils, and fats, paints, chemicals, packaging materials, etc., and factory consumables include lubricating oil, etc., all of which are consumed indirectly and auxiliary.

Strictly, these indirect materials should be separated and not be involved in the item of Direct Material. But in my case, I didn't calculate separately, and included it in the Direct Material, because the amount to be small relatively and to be troublesome.

It is also "Planned".

### **Design Engineering Department**

All kinds of material are tagged the planned cost with individual unique part numbers. When occurring a new part or material, design engineering registers and decide the part number, standard loss rate, yield rate and issue this information by the certain sheet (computer to computer).

### **Procurement Department**

And the procurement department registers the unit purchase price.

Then, In the sheet, all information which are part number, loss rate, and yield rate, standard material cost is registered.

Again,

### **Design Engineering**

On the other hand, Designing Engineering makes a product design when receiving an order. And the product design is written the information of not only the design information but also the information of the quantity of requirement.

### **Cost Control Department**

When getting new order from the customer The sales department or such cost control department needs to prepare the quotation and refer the planned cost. But this planned cost quotation is not always the case of use. The right of sales price decision is taken by the sales department.

(My previous company Sumitomo Wiring Systems has not had this authority, but the mother company Sumitomo Electric Industry has the function of wiring harness sales department and the authority.)

Anyway, this Cost Control department is required to make the planned cost quotation by individual customer's order. And, of course, this planned cost quotation is constructed of planned direct cost and planned indirect cost.

### Quality department.

Anyway, all departments are necessary to make up the annual action plan to develop and reduce cost also annual budget. Yes, it is required to all departments.

These action plans are related to the annual profit plan and are reviewed and evaluated by the management team meeting monthly with this P/L Statement.

## 4. Planned Marginal Profit ( $4 = 1 - 2 - 3$ ).

As you understand, it is to identify the difference between actual sales amount and planned direct cost to calculate the planned marginal profit based on the planned direct cost. But this is just the passing point. And the important things are next Direct Cost Modification and Actual Marginal Profit.

### Direct Cost Modification.

Here, this P/L Statement is compared to the Planned and Actual Direct Cost.

Why it is done such a troublesome thing?... The right picture is an ordinary P/L Statement (Rightside image):

P/L
Sales Ammount
Manufacturing Cost
Gross Margin
Selling Expensenses
General and Admnistrative Expense
Operating Profit
Non-Operative Income
Non-Operative Expense
Ordinary Profit
Extraordinary Profit
Extraordinary Loos
Tax
Net Profit

Above is the normal P/L Statement. And my previous company also makes it by Accounting Department. On the other hand, Accounting Department makes this statement which provides the column of **Direct Cost Modification** too.

The purpose is to identify the effect of Cost Reduction Activity in comparison to the annual profit plan and budget.

A production department is required to make the annual labor efficiency improvement plan & target amount, quality improvement (& quality cost reduction) plan, and other cost reduction plans such as material loss & yield rate reduction, indirect factory expenses reduction.

The Designing Engineering department is required to make the activity plan of VA/VE and target cost reduction amount and design work system development plan. Production Engineering including the machine maintenance department is required to make the action plan of labor & machine efficiency improvement by cost reduction amount and necessary investment.

## 5. Actual Labour Cost (5)

It is easy, and it is the actual payment to direct labor.

The monthly management (team) meeting is held by the 5th. And the past month's result is discussed. Therefore, the result is the result of the past month. The sales amount also is the result of the past month. And, the period of sales amount and labor cost must match.

Direct Cost Modification is to identify the difference between Planned Direct Cost and Actual Direct Cost. And, the important thing is "To sell what was produced this month in the same month".

However, the products produced, quantity, and sales result do not match, if the Inventory Turnover Ratio is bad like this Teaching Company. And there is even a possibility of selling half years old products. Is there a meaning of comparing very much different timing production and sales?

In the Teaching Company, a phenomenon was happening. As I told you before, this company also implemented a similar P/L Statement to mine for factory management. And the labor efficiency was looked like much improving. On the other hand, this company was on the brink of closure and planned to introduce TPM to resolve.

Why such a ridiculous phenomenon was happening?... The causes were the large lot production in small variety products in a month, long LT. Moreover, excess production by the operator. Production total quantity wasn't increased but was large lot production in small variety products. And, such large lot size and long LT caused the excess, obsolescence inventory and dead stock and disposals.

Now, as you understand, the Direct Labour Cost of this Teaching Company looked like getting better.

### **Actual Labour Cost.**

It is easy and is actual expenses against direct labor. And, it can be replaced as next:

$$\text{Actual Labour Cost} = \frac{\text{Actual Direct Working Hours} \times \text{Planned Unit Cost}}{\text{Achieved Efficiency}}$$

Again, "The period of sales amount, and labor cost must match". It is essential.

Is it essential?... If this Teaching Company uses this P/L Statement for a half-year review, it can have meaning. However, the management speed is very much slow.

## **6. Planned Labour Cost (6).**

It is the same as 2.

## **7. Labour Cost Modification (7 = 5 – 6)**

Here, it is required to identify and review the difference between planned and actual labor costs.

**Labor efficiency.**

The labor cost (efficiency) was achieved as planned or not. If not, it was required the report of factory manager very severely what the causes are and also the recovery countermeasures for the month:

- **The review meeting timing:** First week of the month.
- **Recovery countermeasures:** For the other 25 days of this month.

For now, I omit the discussion of the items. But also, the factory manager needs to investigate & review the results and make a report for the management meeting.

**Delivery Time Observance Rate.**

It is compared the planned production and actual to prevent an over-production or production delay and is the daily accumulation. In the factory there is the daily accumulation graph of monthly planned production and daily.

**Crap loss result.****Inventory Turnover Ratio.****Machine Changeover time (Achievement against target).****Quality achievement.**

Customer's quality claim, defect ratio, direct pass ratio, defect points rate, and quality cost.

$$Defect\ Rate = \frac{Defective\ Products}{Total\ Products} \times 100$$

$$Defect\ Points\ Rate = \frac{Total\ Defect\ Parts}{Total\ Products} \times 100$$

For instance:

One product had 3 defective points. Total Production was 10.

$$DefectRate = \left(\frac{1}{10}\right) \times 100 = 10 \text{ (not over 100)}$$

$$DefectpointsRate = \left(\frac{3}{10}\right) \times 100 = 30 \text{ (there is the case of over 100)}$$

The causes investigation is from a wide variety of materials, and which are labor efficiency, quality data, machine performance including machine KPIs. So, please refer the SUMITOMO's meeting system in Factory Management-3<sup>5</sup>

<sup>5</sup> Factory Management III (English):

<https://archive.org/details/FactoryManagement3PolicyStatementAndVision>



## 8. Actual Material Cost (8).

It is also the actual result of material cost.

Actual material costs are reviewed and evaluated with the actual purchase price, actual scrap and disposal cost, disposal of obsolescence. This item also the data gathering system is important. When I was young, this gathering system existed in my previous company (the age of Tokai Electric Wire). However, it was by Gemba worker's manual daily report. The tabulation also was done by a lot of manual work. However, it was thought of as essential work for factory management. Now, the condition of data gathering is very much different and it is the age of IoT and ICT and very much easy and convenient. Anyway, the important thing is how to utilize data do.

This item was also reviewed with many varieties of data which are topics of purchase price fluctuation by purchasing department, VA/VE activity report by design engineering, and total scrap & disposal amount by the accounting department, and scrap loss amount and scrap ratio by the factory.

## 9. Planned Material Cost (9).

Planned Material Cost is constructed of individual Planned purchase price, Planned Cost Reduction (VA/VE, Price cut in negotiation), Planned loss rate. And it is calculated as next.

$$\begin{aligned} \text{Planned Material Cost} &= \\ &= \sum \text{Material Used in Product Sold} \times \text{Material (Standard) Cost} \end{aligned}$$

Material (Standard) Cost is constructed of the standardized purchase price and the Planned Loss or Yield Rate. And

$$\text{Material(Standard) Cost} = \text{Standard Purchased Price} \times (1 + \text{Loss \& Yield Rate})$$

The material or part planned cost is constructed of a unique part number, suppliers, purchase prices, scrap or yield rate, and shelf No. in the database.

## 10. Loss on Disposal of Waste.

This is included in the above Actual Material Cost calculation but highlighted specially.

The scrap & loss is evaluated separately the working scrap, quality defect & disposal, and obsolescence & dead stock disposal very severely and the result of Loss & Yield Rate.

## 11. Material Cost Modification (11 = 8-9)

There was a question about how much time to be the monthly management (team review) meeting because there are so many items.

The answer is 1 ~ 2 (as needed) hours. And they doubted the possibility of discussing all in the time.

Of course, it is possible. But there are some rules:

- One is each section manager needs to make a report in one-page best rule, which is a one-page summary report plus some pages of graphs.
- Secondly, this report is submitted at least one day before up to the grand meeting (management team meeting).
- Thirdly is the contents of the report. It is required the recovery plan for this month's remaining days also the next month's prospect and recovery plan if it is necessary.
- Fourthly, the discussion should be concentrated on the item of not achieving the target. It is quite natural manager's wish to explain the succeeded (achieved) items. But the wish is dismissed by the chairperson (Division manager).

In order to calculate this Material Cost Modification, all the reviewing items are the difference of plan & actual of total amount and achievement about Loss or Yield Rate, VA/VE, Cost Cut by Negotiation, Scrap disposal, Inventory Turnover, Inventory Cycle Counting result, Obsolescence & Dead-stock amount & excess stock, LT, Quality loss & disposal.

## 12. Direct Cost Modification Total (12 = 7+11)

The purposes of this P/L Statement style are not only the confirmation of P/L but also the calculation of Marginal Profit and the investigation of the achievement of efficiencies against the plan and budget. And, it is necessary to review many items. Yes, it is indeed many items.

(Improvement) Action plans & budget of all sections managers, graphs related to the action plans, KPIs of Safety, Quality (Defect Ratio, Customer's quality complain, QC Circles & Group Activities, Labour Efficiency, Machine & Equipment, Loss & scraps, Gemba Muda Reduction, 5Ss, Kaizen suggestions, etc.

Again, is it possible to review all in this monthly meeting? ...Yes, it is possible.

One of the fundamental conditions is the manager's skill of "reading graphs".

The skill of Reading graphs?... Managers are required to understand the Gemba situation in the graphs. But it is too many. How?... How to understand the Gemba situation in graphs?... Of course, there is no time to peruse these by one. There is the word "Gemba Walk". But I don't like this word.

When I was teaching a company, this company promoted the activity with the word of Gemba Walk. And, I got an opportunity to attend a management meeting and found an inconvenient truth which managers didn't know the Gemba. They were doing the meeting without knowing Gemba. They said with one voice that they know the Gemba by the Gemba Walk. It was a very strange scene.

What is “To know Gemba”?... There are machines, people, smell, noise...in Gemba. And, “To know Gemba” is to see these? No, no, no. “To know Gemba” is to recognize normal or abnormal, to be going as planned or not, finding the reason if not going well.

Therefore, it is necessary to provide “Visual Control”. See Making stream of production-11<sup>6</sup> and graphs & diagrams in Gemba.

By the way, it is required to understand so many graphs and charts in the review meeting.

But it is easy if they are doing Gemba Walk daily basis. Because most of the graphs and charts are in the Gemba and being maintained daily basis.

### 13. Outsourcing Cost (13)

Plan and actual of outsourcing amount and KMH.

### 14. Actual Marginal Profit (14 = 4-12-13)

The other purpose of introducing this P/L Statement is next Marginal Profit.

About this, I would explain in the next lecture. And, I omit the description from 15 to 26, because I believe you know well.

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<sup>6</sup> Making stream of production – 11 (English):

[https://archive.org/details/makingstreamofproduction13\\_202001/Making%20Stream%20of%20Production-10./mode/2up](https://archive.org/details/makingstreamofproduction13_202001/Making%20Stream%20of%20Production-10./mode/2up)

Estableciendo la corriente de producción -11 (Spanish):

[https://archive.org/details/establecerlacorrientedeproduccion13\\_202001](https://archive.org/details/establecerlacorrientedeproduccion13_202001)

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### III. Teaching Company

The Sales department of this Teaching Company required the cost reduction to the Production department. However, first of all, how so-called cost by them is calculated? Therefore, it is necessary to be understood Cost by at least Gemba supervisor class and above.

This Teaching Company was facing a serious crisis and was required to decide within a few months. The outbreak of war. My dismissal.

The origin of this is my word and attitude. When they made the urgent meeting of "Profit Recovery", I said that "one of a good idea is to dismiss me (TPM-13<sup>7</sup>)". Also, the original problem is the difference between policy understanding and direction.

My attitude!? ...I didn't change and told them that anytime you can dismiss me. Another problem is the policy understanding and the direction. As I wrote before, the final purpose of the policy is to reduce cost for "Profit recovery". Then the president decided on the policy of "Introduction of Total Productive Maintenance" and started.



#### **Cost reduction and Muda reduction.**

*I never use and want the word "cost reduction".*

*By the way, I use the words Cost Reduction and Cost efficiency. I don't like the word of Cost Reduction (as I wrote before). But if it is necessary to use the word **Cost for profit improvement**, I recommend using the word Cost efficiency improvement. Spending cost is an investment. And this investment is planned in the policy & strategy.*

*I saw many companies who are very eager to cost reduction as a company-wide activity. And the step is the policy announcement, allocation to each department the reduction rate and actual amount, making action plan by each department, implementation, aggregating & evaluation the monthly results by accounting, monthly review in the management team meeting, requirement of the recovery plan (if not to reach to the target) and repeat this cycle.*

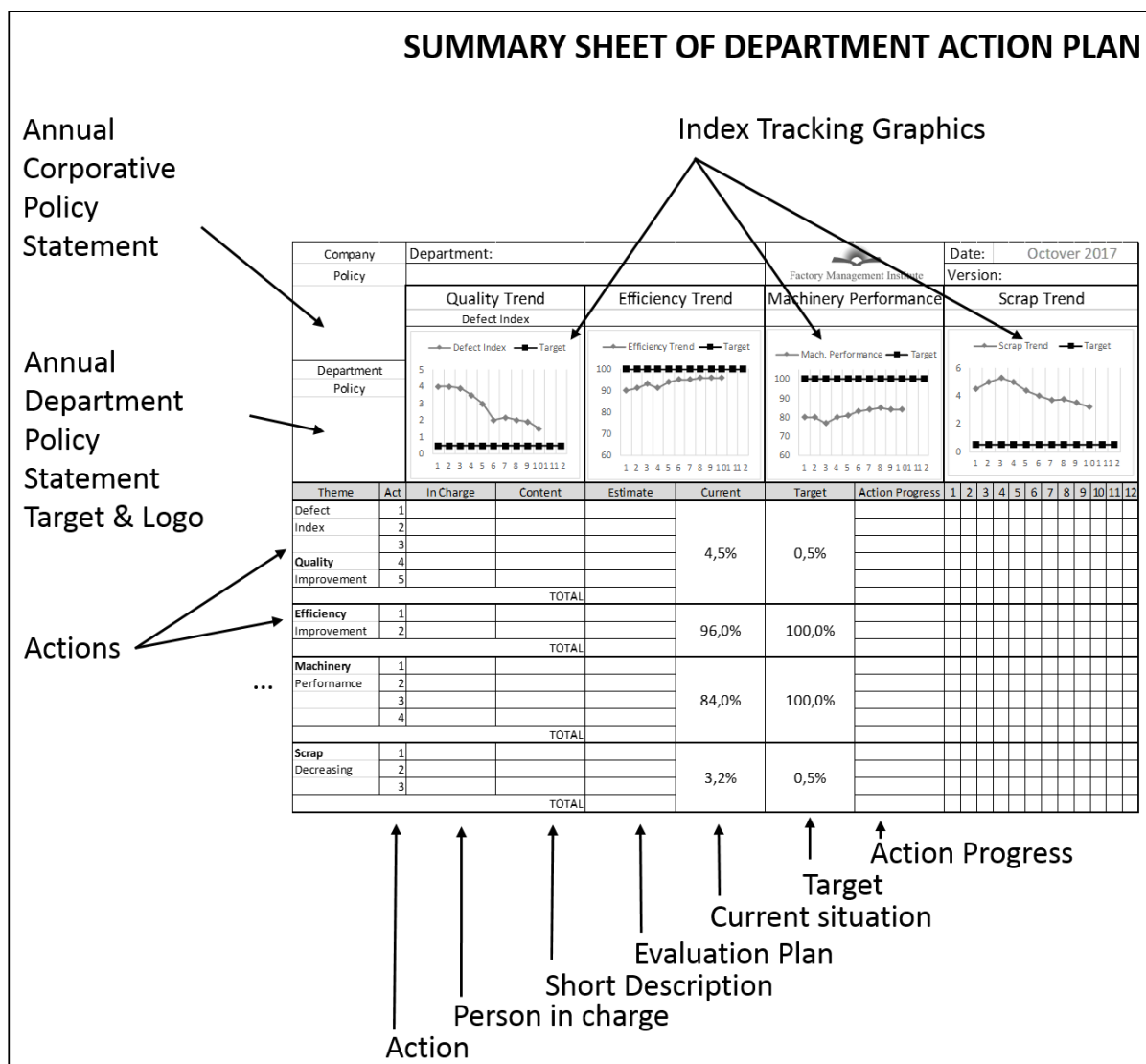
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<sup>7</sup> TPM-13 (English): <https://archive.org/details/tpm-13-oil-control-3> (Spanish): <https://archive.org/details/tpm-13-control-de-la-lubricacion-3>

## Action Plan

For your reference, I show you again the format of the Action Plan.

My previous company used the next format for Cost Efficiency Improvement Plan<sup>8</sup>.



When looking at their items of the action plan, these are never healthy ideas.

When looking at corporate management, this is natural, but at some stage of growth, any company will need to pursue “cost-efficiency” and will struggle to reduce costs. Please keep in mind that pursuing cost efficiency is not the same as reducing costs.

<sup>8</sup> **The System of Excellence** (The Factory Management Encyclopedia, Vol. I) Factory Management Institute: <https://www.amazon.com/dp/B077SGKS81>  
**El Sistema de la Excelencia** (Enciclopedia de Gestión de Fábrica, Vol. I) Factory Management Institute: <https://www.amazon.com/dp/B0744PTWF4>

The traditional approach is (for example) a company-wide uniform cost reduction of 10%. In the human analogy, it's the same as trying to lose weight with a short-term diet, which often doesn't last long and weakens the muscles you need.

I simply call the cost efficiency improvement to generate growth potential and "transformation to growth", but it is easy to imagine if you think of it as fitness that strengthens the muscles necessary for growth. Capabilities that are the source of a company's uniqueness, that is training that strengthens muscles while reducing fat, that is, training to increase cost-efficiency.

The problem is that in any country and this teaching company also, most companies discuss the cost agenda and the growth agenda separately. Growth is managed by the corporate planning department and top management, and costs are managed completely separately. This cannot close the gap between strategy and execution.

In order for the strategy to work well, it is necessary to combine the growth and cost agendas, operate them in an integrated manner, and make them consistent. Therefore, it is important to formulate policy & strategy combined. And, the procedure is described as next:

## Formulate Policy & Strategy Combined



### 1) Clearly define the capabilities that characterize your company.

Rather than setting cost reduction targets of 10% and 15% for the entire company, it is a clear definition of the capabilities that are the source of the company's uniqueness and that characterize the company.

Capabilities here are a collection of processes, tools, knowledge, skills, and organizations that a company needs to continuously produce results.

### 2) Identify differentiation.

You have to win the corporate competition. To do that, we need to differentiate. And if you have a clear idea of what you need to differentiate, you will naturally know what you don't need and what you should stop doing.

### 3) Muda reduction.

We will prioritize the necessary investments for capabilities that differentiate us from our competitors while keeping other costs to the minimum level necessary for competition or the minimum level for business execution.

And for things or features that aren't creating or aren't creating value, you should either abolish or boldly cut costs.

Also, in areas where investment should be concentrated, investment should not be stopped altogether even in difficult business environments, and cost reductions should not be uniform as in other areas.

When listening to the desire of profit recovery of this company with Cost Reduction, I had a concern about the relation between the Policy and Strategy (Middle term or long term) and also the relation of the profit recovery plan. Maybe they make the profit recovery action plan in the idea of unpredictably and from whim.

The president decided to keep internal capacity (labor and machine) even though the outsourcing policy was decided. And he expected the sales expansion with using the remaining capacity. And, he may have been thinking of the combination of policy, strategy, and profit recovery. (Though the Outsourcing policy was a mistake.)

Back to the conversation with the Accountant Manager...

Later, I describe the mismatching and contradiction between the policy and the final purpose (profit recovery in cost reduction). Some directors were following my way. But some directors insisted on the original policy which is to introduce Total "Productive" maintenance (or management), 8 pillars, and Nakajima's 12 steps. However, the ultimate goal of each side was the same and to recover the profit. Also, they shared the same sense that it is not good for future activity if the directions were different in the management team.

Then they decided to make an internal discussion, before the suggestion of my dismissal to the president.

As usual, the Accountant Manager visited my hotel and informed me of the above movement. Also, he informed me another news which Sales department advertised the product with the price below the "Prohibition of Receiving order in Red".

—Sensei —Accountant Manager started—. A big problem has happened. We (the management team) need to discuss your dismissal.

—Ha, ha, ha —I laughed—. It is good. I also planned to draw my hand from your company. And, it is good timing.

—Please don't say a joke. From now seriously we need your help —Accountant Manager admitted—. If we cannot find and implement some solutions to reduce cost and profit recovery, our company will be downsized and probably goes into liquidation.

—Listen Mr. Accountant Manager. Almost, my job which is to introduce Total Preventive Maintenance is done. Total Preventive Maintenance is Total + Preventive Maintenance. The part of "Preventive Maintenance". The basic system for PM (Preventive Maintenance by the department and technicians) has been done. Introduction of KPIs, Machine health check record in computer, Skill level evaluation & training system, Bolt & Nut training, Oiling system, Daily Check sheet record, ANDON, 5Ss of maintenance room, Essential tools (Such oil bath, Marble Stone Plate, etc.), Spare parts control, etc. But —I admitted—, The part of "Total".... —I hesitated—. There are 3 essential factors for "Total" (Company-wide activity) which are **Gemba involvement, Management involvement, and The System:**

**Firstly Gemba:** Stability of Gemba Committee activity based on 5Ss and Kaizen & group activity. Particularly, the factory situation of 5Ss is remarkable. Also, some group activities are challenging daily check sheets and preparation of oiling. Of course, there are some parts



which are the education of oiling points, kinds of oil, oiling point labels, (oil pass drawing by manual; not been done), training of easy repair and the skill evaluation (also are not finished).

**Management and system:** Management team was established. I know it is not yet improved the skills such as Meeting, data gathering, and utilization, Policy & reflection to action plan & follow-up.

—Mr. Accountant Director —I call his attention—. Would you please understand?... I can teach the correct KATA (form). But to gain sufficient effect, it is necessary some years and experience. And one of the important elements is the management team to maintain the involvement.

—I saw many companies and activities —I continued—. And I understood that most of the failure cases are the lack of maintaining the involvement of management. I taught 5Ss for establishing Gemba participation in the company-wide activity. My previous company Sumitomo doesn't call it as 5Ss, but 6Ss. Which are *Seiri, Seiton, Seiso, Seiketsu, Shitsuke* and finally *Shuukan* (習慣).

**Shuukan** (習慣): It is the meaning of habit or custom. Sumitomo thinks that the most difficult process is **Shuukan**. And it is the activity of 5Ss items to sublimate into the corporate culture. Not only the 5Ss activity but all good activity such **Kaizen**, QC Circle & group activity, 4Rs (Make a rule, Teach rule, Keep rule and Change rule) activity must be sublimated as a corporate culture. Many companies fail this process and fail to stabilize the activities in the **Gemba**. The solution is the involvement & commitment of management. And, the methods of management's involvement and commitment are Gemba organization, Committee, Award system, Visibility in Notice board, Score and Use as one of essential management index.

— For the Management Team... I know that it has still little experience. But I believe time resolves it. And during this term, you don't need me —I admitted—. And just, you and the management team need to maintain your strong mind of involvement. It is the timing to draw my hand from your company.

—I understand —the Accountant Manager then showed his concern—. But... Currently, my biggest concern is the aerial decomposition of the Management Team.

—It is a problem. Let's find the solution in the meeting —and then, it was decided that I attend the meeting...

## The meeting

This meeting was presented by the Chairperson. The chairperson is a rotation system. And, at this time, the HR department manager was the chairperson —Let's start the regular meeting. And, we invited our consultant, Mr. Kimura, especially. The special theme is the formulation of the "Profit Recovery Plan". Also, the adjustment of the direction of management.

—First of all, we discuss the problem of management direction difference —Chairperson introduced and he dived into many other details those I prefer to omit, except the conclusion. —The choice is to continue my way or back to Total Productive Maintenance with 8 pillars & Nakajima's steps.

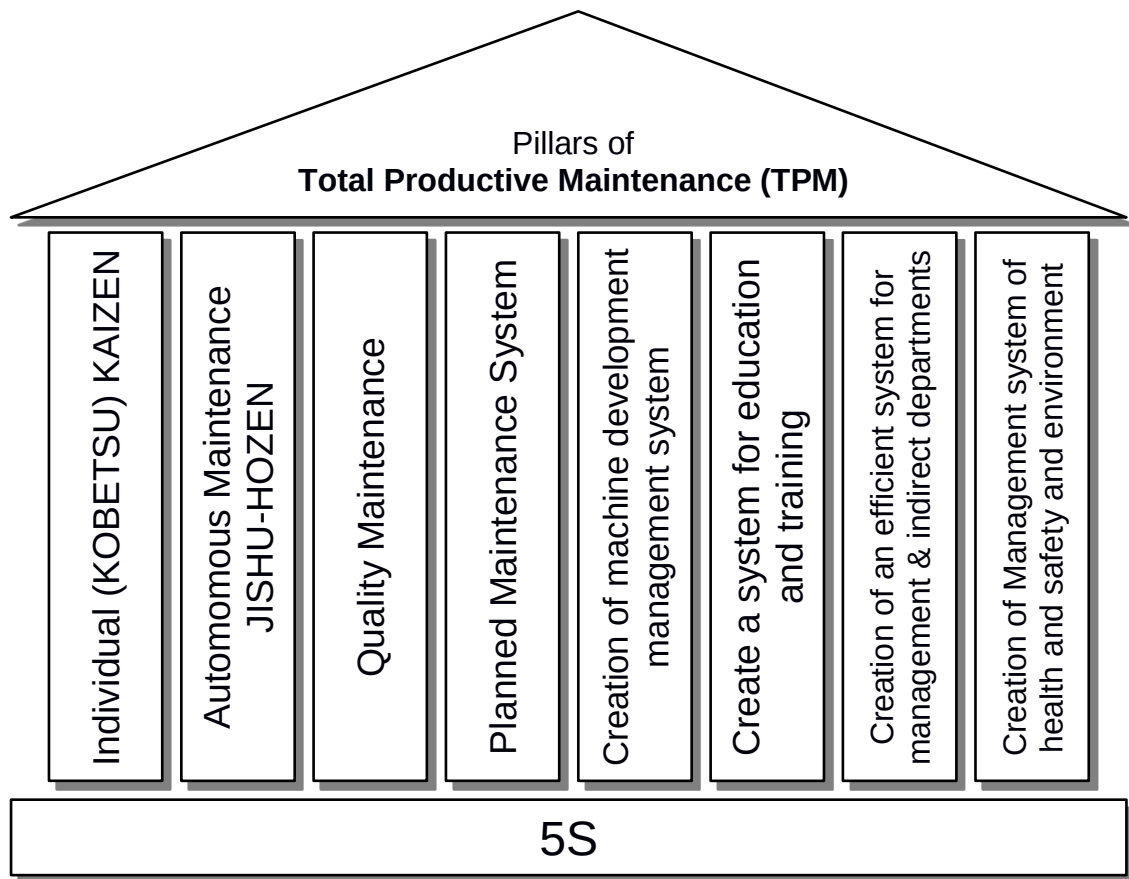
The first in intervening was the production manager and his proponents. —Thanking Mr. Kimura. But anyway, we need to go back to the original policy which is Total Productive Maintenance or

Management which involved all categories of necessary factory management items. Now we believe that we can follow the 8 pillars and Nakajima's steps.

—Sensei —joint the Chairperson—, please let us know your opinion.

—Very good. And, I also think that you can continue this activity by just yourself. Because you are already doing the 8 pillars items excluding one meaningless item. Thank you very much for giving me this opportunity and please accept me to make my presentation. I explain the current situation in the story of the 8 pillars. OK? —I asked—. Thanks.

—Let's look at one by one of 8 pillars. (From TPM-7<sup>9</sup>) ...



<sup>9</sup> TPM-7 (English): <https://archive.org/details/TPM7SeisoInJishuHozen>

TPM-7 (Spanish): <https://archive.org/details/TPM5SeisoEnJishuHozen>

## TPM Pillars



### 1) Individual (Kobetsu) Kaizen

—It is to investigate and quantify losses by production process and equipment to reduce losses and gain real profits. By whom? ...By **Gemba** people and each class management. And, You have already started and been getting the effects —I recognized to the Accountant Manager—. In this way, please let's compare the past situation and now:

#### The past:

In the past, you have made **action plans** for cost reduction. And, I have seen some. My frank impression was that it is impossible to gain the effects. Because:

- 1) These action plans were only the wish lists.
- 2) There was no data background (Current situation, Achievement Perspective, and the Effect). (Reference next picture)
- 3) The person in charge was vague. Taking action by a person, by a group, what?
- 4) KPIs, data gathering systems were not prepared sufficiently.
- 5) Therefore, it was impossible to evaluate in data.
- 6) There was no follow-up system as the company-wide activity.

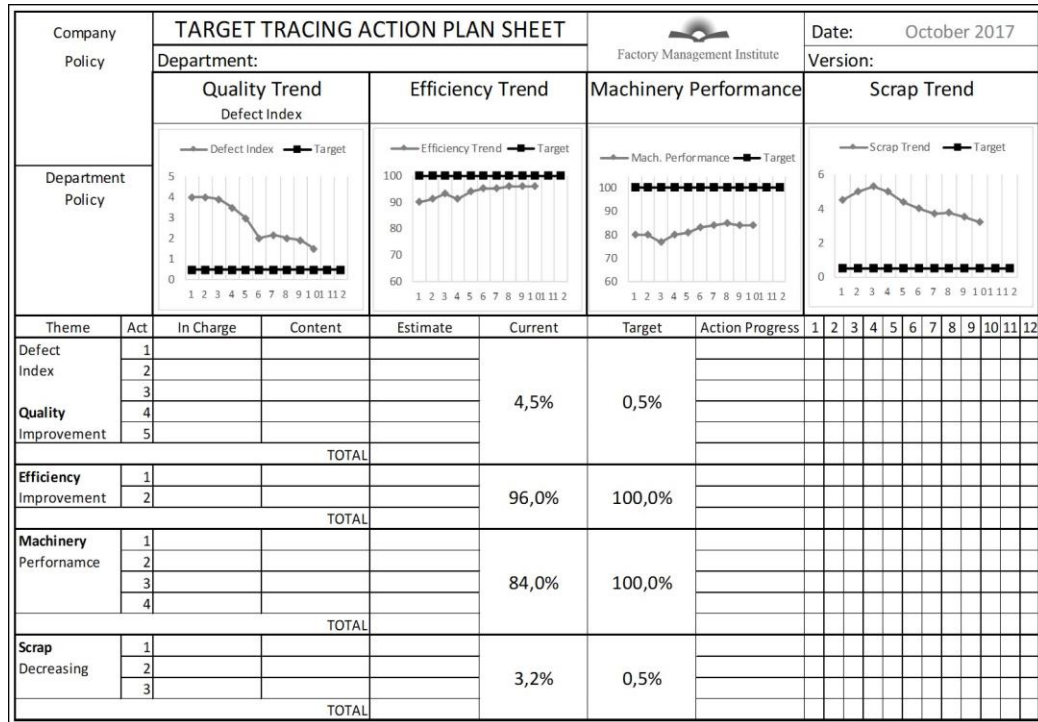
#### Current:

The project team made 2 things, which are Current situation analysis in data gathering (accounting data, Gemba data), and in Investigation of the current situation (with Man-Machine Work Sampling, QC Process Diagram for major products, Spot data gathering, Pareto Chart, etc).

Based on the above, they suggested the action plan. And, this action plan has of course action items with data background, the suggestion of concrete action, clear responsibility (just the department, and it is required to nominate the person in charge by departments), effect in numerical evaluation, necessary investment and follow up action plan sheet. (Reference next page picture).

Follow up and evaluation by management. You have already the organization of the Management Team and the meeting system.

—I know that it is necessary to accumulate experience and achievements. Clearly, I say that the project team worked very well. But the management system is still immature. Although, it is quite true that you have already started —I continued...



## 2) Jishu-Hozen system by operator.

—As I have taught, **Jishu-Hozen** has clear steps, which are: Establishment of PM (Preventive Maintenance by the department & technicians) —I omit because I wrote about that before.

—Then you have already the system of PM. The skill training & evaluation of technicians are almost finished as the system. And, when beginning this re-start of the TPM introduction, we introduced the Gemba Committee. So, this Gemba Committee has the function of 5Ss implementation & stability, Kaizen & suggestion, Safety patrol, and Group activity —I continued...

—And in the Group activity, they did excellent work for machine condition improvement. I evaluate their activities as one of the steps of **Jishu-Maintenance**. Of course, some steps remained such as operator education & training & skill evaluation. The system has already been introduced. However, I can say that you already cleared the most difficult step, which is the base of operator involvement in “All People’s Participation”. Consequentially, You can maintain and stabilize this activity, if you maintain your strong sense of involvement and commitment to the **Gemba** activity.



## 3) Quality Maintenance

It is an activity to prevent the loss of defects by **setting conditions** that will not cause defects, **maintaining and managing the conditions**, and **predicting in advance the possibility of the occurrence of defects**.

—This item is the theme of Quality Control. The range of Quality control is the working performed by people & working method, materials, Tool & equipment. And, this item targets the prevention of defective losses from the tool & equipment —I detailed.

—Once again, the explanation words... There are the keywords, which are by setting conditions, maintaining and managing the conditions, and predicting in advance the possibility of the occurrence...

### By setting condition

—This is the meaning of Prevention of setup mistakes which are including material mistakes (kind of material, size), adjustment mistakes (high, dimension), and condition mistakes (air, pressure, oil, electricity).

### Maintaining and managing the conditions

—This is the range of Quality control and TPM. How to prevent the above setup mistake and keep proper machine condition do....

—The biggest item of defects and material loss is the wrong setting condition. When looking at the investigation with Pareto Chart by the project team, the top problem is this setup mistake. On the other hand, it was a very rare occurring defect caused by the machine's accuracy itself. The project team already has suggested the proper countermeasures... —And I detailed—, one is to make the self-inspection by the operator with the initial product to avoid set-up mistakes. But unfortunately, still, this countermeasure wasn't accepted by operators yet.

### Predicting in advance the possibility of the occurrence

—Now, your factory is better than the previous one. 5Ss in Gemba (production and office Gemba), machine 5Ss. These are much better than before. Which is the meaning of the reduction of instability and uncertainty. However, to do “predicting in advance the possibility of the occurrence”!? —I asked myself— ...This item is stupid and impossible so far. This description is ridiculous.

—Sensei —joint a new Management Team's member, the Engineering Manager—. Recently, I was introduced to a new machine by a machine tool company. And, they recommended us to introduce much higher performance machines. And, the characteristics of this machine are not only the speed in good accuracy but also has the function of maintenance-free. They said that maintenance-free machine tools will be the main tide from now. But actually, their talking of “maintenance free” is a failure diagnostic device constructed of various sensors. And it is possible to find problems before failure. This high-speed machine is attractive. And, I and our Production Manager discussed introducing and replacing with current main machines. Therefore, it cannot say “impossible”.

—I understand Mr. Engineering Manager —I admitted—. Your talking is probably Condition Based Maintenance. And, as an engineer, it is important to watch the tide of engineering. But, now, everyone. Please understand where are you. I'm teaching TPM. And, his comment is the tide of future maintenance techniques.

As I write below, the concept of Condition Based Maintenance has existed when I was teaching this company at 200X year.

—When looking at the tide of machine maintenance, there are Breakdown Maintenance (BM), **Time Based Maintenance (TBM)**, and **Condition Based Maintenance (CBM)**. —I continued...

—Breakdown Maintenance is the most primitive one, which is to repair it after finding the breakdown. And Time Based Maintenance is simply the range of PM (Preventive Maintenance). Now, you have already moved from BM to PM furthermore starting TPM. However, TPM is also the range

of TBM. Mr. Engineering Manager, am I right so far? —the Engineering Manager nodded—. I know that the current main tide is still TBM. And TBM-based PM is not sufficient or has a lack.



### **Condition Based Maintenance (CBM)**

*CBM? ...What is CBM. What is Condition? ...At what condition, do we need to plan or implement maintenance? ...Anyway, the naming of “C” BM is not suitable. I made such a conversation with my friend who is an expert on TPM.*

*Then he made me a lecture about CBM as next.*

*CBM is referred to as **condition monitoring & predictive diagnosis** maintenance, TBM is referred to as Time-based Maintenance Planning & Implementation, failure finding work is referred to as FF: Failure Finding Task, and maintenance performed after FF is referred to as BM: Breakdown Maintenance.*

*Then, the most appropriate one from these should be selected as a maintenance policy for each piece of equipment and part, and the maintenance work should be decided according to that policy.*

*The key activity is to provide sensors and computing systems (Edge computing, IoT, AI) for data gathering and analyzing.*

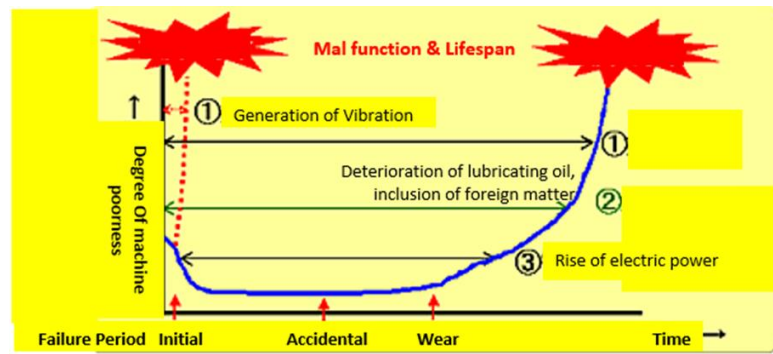
*Moreover, to implement CBM there are essential elements as the back data which are*

- 1. Collection of equipment information: Confirm the production capacity and operation policy of the target machine & equipment.*
- 2. Specification survey: Investigate and organize the specification data of the target machine & equipment.*
- 3. Functional analysis: Confirm functions and performance standards.*
- 4. Functional failure analysis: Check the defective state from the functional aspect.*
- 5. Failure mode impact analysis: Analyze the causes of functional failures and the effects of failures.*
- 6. History collection: Investigate the maintenance history of the subject and examine the basis for failure effects and probability of occurrence.*
- 7. Failure risk assessment: Evaluate the risk of each failure effect.*

*Now, according to the literature, CBM is explained as next: “CBM is a preventive maintenance concept that does not implement maintenance such as unnecessary equipment replacement for equipment that is currently operating stably, but only when it is deemed necessary.”*

*On the other hand, TBM is a PM or TPM that implements maintenance at regular time intervals to prevent failures in advance.*

*However, TBM indeed has problems... The temporal transition of the machine failure rate is divided into three periods: (1) initial failure period, (2) accidental failure period, and (3) wear failure period and is known as the bathtub curve (Fig. Next).*



*In the past, TBM was used to ensure and improve the reliability of equipment by performing regular replacement maintenance before wear and tear according to machine specifications such as product life. However, many maintenance defects such as troubles due to initial defects associated with replacement occur (there are reports that about 30% of the causes of failures are due to maintenance defects), which has become a problem.*

*At TBM, the main focus is to prevent machine outages due to a rapid increase in the failure rate during the wear failure period by performing maintenance during the accidental failure period when the machine is operating stably. However, if maintenance is performed unnecessarily during the period of stable operation and low failure rate, the failure rate may worsen (shift to a high failure rate in the initial failure period) by replacement.*

*In other words, the reliability of the machine as a whole may decrease even though maintenance is being carried out.*

*And now, CBM is attracting attention as a new concept of preventive maintenance in the future.*

*The concept of CBM itself was widespread in the 1970s, but the installation cost of machines such as the installation of sensors that collect data used for failure diagnosis and computers for data analysis and assumed failures were calculated was expensive. From the viewpoint of complicated processing, it was not widely put into practical use at that time.*

*With the progress of ICT technology (Information and Communication Technology) in recent years, rational maintenance that makes full use of data has become possible, and CBM is currently being applied to various facilities, equipment, and industrial plants.*

*For example, GE has a proven track record in gas engines, wind turbines, and aircraft (in collaboration with Boeing). In addition, a business is being developed that visualizes the equipment status such as aging and abnormality detection for social infrastructures such as tunnels, bridges, and roads, and provides condition monitoring and predictive diagnosis for implementing CBM as a service.*

*While industrial innovation utilizing IoT (Internet of Things) technology such as Industrie 4.0 and Industrial Internet is spreading into social and industrial systems in earnest, sensing technology and big data refined by MEMS (Micro Electro Mechanical Systems) It is expected that CBM will progress due to the further advancement of data analysis technology.*

*In this way, there is no doubt that it will have merits like TBM and become a future trend.*



*But it is not so simple and easy. And, the following issues are raised.*

- *There are cases where a new inspection/measurement needs to be introduced.*
- *A huge amount of data collection and establishing a method of utilizing it.*
- *Prevention of serious measurement errors (data quality).*

*(If there is a measurement error, a serious malfunction may occur due to machine failure.)*

*As countermeasures for the above problems, it is necessary to take measures such as IoT conversion of production equipment, Probability of diagnostic technology by utilizing AI.*

*And we have to take measures such as preventing judgment mistakes by adopting multiple measurement items.*

...Going back to my presentation and conversation.

—Mr. Engineering Manager —I call his attention—. My task in this company is to establish TPM grounded on the Time Based PM and, isn't included CBM. And, one of my TPM concepts is to lengthen the lifespan of machines. You wish to replace the main machines, which don't finish the depreciation and also are still possible to use sufficiently.

—Wait a minute Kimura —Interrupted the Production Manager—. You shouldn't escape from the topic. You always divert from our wish to discuss. We are seriously wishing to improve efficiency and thinking to replace old machines to this new type. You told us to use planned outage machines with hiring new operators. It is ridiculous. Because both machine and labor efficiency will be worse.

I felt a tweet in my heart. Escape! ...Divert from the topic! ...They cannot understand what efficiency is still. —Everyone —I called his attention—. I cannot finish my presentation. Shall I ignore their provocation? ...Or do you accept to expand my presentation time longer than planned?

—Sensei —joint the Accountant Manager—. If you can accept, please continue and clarify their doubt.

—OK thanks. Let's debate. And, the theme of the debate is Speed & Efficiency. OK? ...Firstly "Speed". Mr. Engineering Manufacturing. What is machine "Speed"? —I asked him.

—Machine speed is the machine efficiency itself —he answered.

—I advise you — I called his attention—, to look at Speed not only from machine performance but also from "Sale". Your thought is just from the machine performance. And, the calculation formula is  $\text{Speed} = \text{Used hours} / \text{Output}$ . It is "Time required per piece". Therefore, the more producing is, the more numerical value is.

—By the way Mr. Engineering Manager. What is "Output"? —I asked him.

—Output is machine production result —He answered with an indignant attitude.

—I believe that this point is a different view against mine —I told him just a little disappointed—. My view about the base of "Output" is not the machine performance, but the sale. It is how much the output contributes to sales amount does. Therefore, there is no meaning even though output increased if the output doesn't contribute to the sale.

—By the way. Do you know the inconvenient truth about your company's high-cost constitution? —I asked him— ...Poor quality (it is not related to the machine accuracy), many inspectors for double



inspection, obsolescence & deadstock, excess inventory, etc. And, the cause which is to accelerate bad cycle is too big lot size. Therefore, your company's constitution is "produces many and dispose of many".

—Mr. Engineering Manager. "Speed" is output capacity. But your company has abundant machine capacity to respond to future increased sales already. Therefore, it is no meaning to increase additional capacity —and I continued...

—I said the high-cost constitution and bad cycle. I wished to suggest resolving this bad cycle from three dimensions without quality issues. One is to shorten LT. Another one is a smaller lot size. And the last one is TPM including SMED.

—Now we may speak about Labour Efficiency. Mr. Engineering Manufacturing —I asked him kindly—. You mentioned the wish for labor efficiency improvement. Does high-speed machine effects improve labor efficiency? ...The answer is "yes". But there is a condition, which is: Few kinds of products, very large lot size (few changeover frequencies) and, by the same number of operators (for instance one machine/one operator). In such conditions, a high-speed machine is better to labor and machine efficiency than a slower one. However, is there such big purchase order by one lot at present?

—I believe —the Engineering Manager told—, that there are such big lot products which it is possible to move machines whole day. I make Gemba Walk every day and watch the movement of machines.

I was listening to his dissertation but I felt some kind of frustration. And whispered in my mind. Gemba Walk by the blind person has no meaning.

Then the Production Planning Manager joint showing a bitter face —Mr. Engineering Manager —he emphasized—, there is no such big lot order from customers. Sometimes operators make claims against the small lot size production and require us to summarize the lot to bigger production lot still now. Moreover, after the policy of half month's order and increasing the changeover to double, not only this requirement but also the production not ordered are increased.

And then, another new member of the Directors Team, the Warehouse Manager, joined the conversation —I know about that issue. Recently, the cases of mismatching between the production tag and real numerical value are increased. This problem is related to the products and raw materials wrong inventory.

All managers attended to this argument. And, it was the state of being out of control. All managers attended also the members of the management team. And I understood that the managers class had complained about the current status.

—Please calm down everyone —the Chairperson said—. Anyway, let us listen to Sensei's presentation up to the final.

—Thanks Mr. Chairperson. Now we are talking about Labour Efficiency. And, this answer is the question of the relation between speed and labor efficiency. This answer is also the same as the relation of Speed and, Machine Efficiency. Therefore, I explain the same thing...

—When assuming to compare 2 machines which are slow machine and high-speed machine and both of cases, operated by one operator. The high-speed machine can be better efficient than a slow machine by a condition. The basic condition for both is products to be able to sell them, in short term...

—And, the essential condition is Quick Changeover. In this case, the machine efficiency will be down dramatically. According to the investigation and the Histogram of receiving the order by customers by the project team, the order quantity average is 30 and minimum 2 and maximum 130...

—You need to recognize the order quantity situation which is completely High-mix low-volume production. And the most cost-effective method for the machine is not the speed but is to use the machines which finished the depreciation (fixed cost). And please consider the “Speed” from the point of JIT and LT (Lead Time)...

—To solve the issue of LT, you have already many machines. I never say that a high-speed machine is worse than a slow-speed machine. But I say again that “speed” is a matter of production capacity. If you buy a high-speed machine, you need to recognize the worse machine efficiency, because of increasing changeover frequency...

—Mr. Engineering Manager, —I asked—. You have already the necessary production capacity by old and a low-speed machine, which have depreciation still. You need to use these effectively. And increasing additional new depreciation is not a good idea. Please discuss with Accountant Department when deciding to introduce such high-speed machines.

—Everyone —I call their attention—. Can I proceed to next? ...Let us proceed a little in a hurry because we spent too long time so far...



#### 4) Planned maintenance system

It is an activity by the maintenance department. And it is an activity that aims at zero failure and maintenance cost reduction by performing machine deterioration diagnosis and restoration and extending the machine life by improving maintenance.

—As you understand —I talked about something I supposed they already knew—, it is the range of PM (Preventive Maintenance). And, you have already started the proper PM in the Data gathering system (KPIs), Machine health check record, Regular diagnosis & maintenance activity, and Spare parts Inventory control.

The re-education & training of technicians and evaluation system is preparing, (not finished, but ongoing. As I explained, this activity is now transitioning to “Total”.



#### 5) Creation of machine development management system

It is an activity that aims at putting production on track in a short period of time in the development and design stages of products and equipment, preventing losses and problems that are expected to occur during production.

—I call this Initial Product Quality Control and establish the Committee (IPQC & C) at the opportunity of a new product, new machine, and new method introduction in a production process.

I teach this into OJT (On the Job Training), and into TQM. This is one of the essential teachings in Total Quality Management. This so-called IPQC & C provides 9 subcommittees which are Design development, Material & Procurement & Inventory Control, Tool & machine development, Production Engineering, Production Planning, Training, Quality Assurance, Cost, and Safety & Environment.



the methodologies. It is an insufficient theme setting. Again, the explanation of "5) Creation of machine development management system" is like as above (which is of the original explanation of JIPM).

Activity?... What are the activity contents and by whom?... By only the Design engineering and Facility development department?... Is it possible to implement by just them?... How about safety?... How about the cost?

My understanding is that (again) this item is just one part of IPQC.

In fact, I taught this IPQC temporarily, when returning the products to in-house production from outsourcing. It wasn't full but simplified. At this time the committee was constructed of the project team which is constructed of Accounting, HR, Design Engineering, Production Engineering, Production planning, General affairs, Material control, QA, Sales, Maintenance, Gemba supervisor Total 11 members. And, I taught the Kata. But I know it is never sufficient. Other experiences are necessary. Please accept that just I could gain the opportunity of teaching Kata.



### **Kata (in Japanese 型)**

2 things...

#### **1) Shu Ha and Ri (守破離)**

*Originally, it is the word of one of the traditional Japanese performing arts "Noh". It has also come to be used in Kendo and Tea ceremony and shows the stage of training and progress. "Shu" is the stage of faithfully observing the teachings, patterns, and techniques of teachers and (Kendo) schools, and surely acquiring them. "Ha" is the stage of thinking about the teachings of other teachers and schools and/or developing by himself, incorporating good things, and developing mental and skills. "Ri" is the stage of moving away from one school and creating and establishing something new and unique.*

#### **2) Kata**

*When teaching a company, we firstly teach Kata which is the stage of "Shu". As a teacher, we need to teach our Kata which we established to the company. The Kata may be the same to (as for instance) Toyota Kanban System. However, a company has its own characteristics. Therefore, the Kata taught may be required to modify. And a modified Kata is considered. This step is "Ha" and we need support to guide the company. Our task and contract may be up to this stage in max. "Ri" is almost the company's self-development.*

Going back... They provided (as you know) 3 development steps which were the mass-production trial. And They discussed the confirmation and action items in each department.

They have already the experience of relevant products. But I taught the Sumitomo rule which is the timing and occasion of IPQC necessity and is 3Hs (**Hajimete, Henkou, Hisashiburi**).

**3Hs****Hajimete:** First experience to produce or use.**Henkou:** Production process modification such as design change, material change, production method change (include tool & machine).**Hisashiburi:** Experienced products or processes, but long-term intervals after stopping.

I believe the system image of 5) is IPQC, and they could understand the Kata. But I felt in my heart that nothing will be stabled in this company, even though I teach many. Because one of my concerns was too high turnover in still low employee engagement.

—Everyone OK? May I continue my presentation? OK. Let' continue.



## 6) Create a system for education and training.

—It is an activity that organizes the knowledge and skills to be necessary to proceed with work and improves skills to reduce and prevent loss.

—This item is just started. And as you know, the education & training & skill evaluation of maintenance technicians is ongoing. This is one part of PM (Preventive Maintenance) activity. As the basic skill, Bolt & Nut tightening up, Oiling, Oil bath, Measuring instrument, Horizontal/vertical Centering, Machine vibration diagnosis, Disassembly & assembly, etc. And following to re-education of technicians, the education & training of the operator for Total Preventive maintenance was started in the next 4 steps:

- ✓ The 1<sup>st</sup> is to list up the necessary skill of finding abnormality and the use of ANDON and the teaching of Daily, Weekly, and Monthly Check-sheet.
- ✓ The 2<sup>nd</sup> step is the teaching and implementation of machine 5Ss.
- ✓ The 3<sup>rd</sup> step is the correct & standardized set-up method.
- ✓ The 4<sup>th</sup> step is the transfer of simple maintenance activities such as Oiling.

—And the progress is still the 2<sup>nd</sup> step finished and the beginning of 3<sup>rd</sup>.

—One caution is that education & training items are revised daily. And this activity will be continued a little term and will be stabled with a proper manual. Right now, the situation is in a transitional period.

—In parallel, I recommend you to start an activity of Motivation Improvement (Employee Engagement) as a company. And it is not my task.

—In here, I wish to tell you my excuse —I begged—. I'm not an expert on your machine. Rather than me, your technicians and operators know their machines. Therefore, we need to use and draw their knowledge and use it. And, as they progress, in TPM, PM (Preventive maintenance) was almost finished and the activity of "Total" was started.

—I think you can continue and develop this activity by yourself without me. But just one, there is a condition, which is you to **maintain your interest and involvement**.

## 7) Creation of an efficient system for management & indirect departments. And...



—It is, and to conduct similar activities in its own departments.

— “to support activities to reduce and prevent losses at production Gemba”. This item pointed out is ridiculous, because it is too natural. What is the major task of the indirect department? ... **The Major task of the indirect departments is to support Production Gemba which creates the products and profit.** I believe any departments have the will of supporting Production Gemba. However, and again...

—I do nothing for it. But I advise you 3 things:

- 1) **Firstly** is to make a job description (business responsibility, procedure) of each department. I haven't seen it. But if you have, please revise it.  
And the project team (which the leader is an accounting staff) reviewed and improved the way for supporting production Gemba in the data gathering system and feedback involving the IT expert.
- 2) **Secondly** is to ignore the sentence distribution of “and to conduct similar activities in its own departments”. (Similar activity? ...It is, totally, the word of an amateur.)
- 3) **Thirdly** is to organize the activity of office Gemba quality improvement and Muda reduction.

—The biggest idea of office Gemba Muda reduction is to improve office work quality which includes the abolition of unnecessary work and process improvement.

—In Sumitomo, the so-called “office work inventory check” checks all office work, the procedure, record, and data and shaves off Mudas regularly. Office work also accumulates the Muda in a term before one knows it. Please —I beg them— do it by yourself.

## 8) Creation of a Management system of health and safety and environment.



—It is an activity aimed at achieving a workplace with zero disasters, zero pollution, zero garbage, and a comfortable workplace...

—But before going to this theme —I stopped my argumentation for a while—, I told you before that “8 pillars” is like toothlessness (missing tooth; not sufficient). There are many. Indeed, many medium-sized companies (like you) wish for TPM introduction and the help of establishing 8 pillars. There are no large companies’ clients introducing TPM in this way, because they can do it by themselves...

—Although there are some big companies, they don't introduce the 8 pillars, but for getting the rating. JIPM is one of the Rating Agency. Or they use the name of TPM as the banner of companywide activity for the next step. Therefore, it is possible to say that major customers of JIPM are under medium size companies...

—And many medium-size class companies ask a consultant to introduce it (and require 8 pillars). But unfortunately, in most of the cases, the introduction and particularly the stability are failed. Why?... Simple: “8 pillars” shows the goal which should be as a company from the point of view of machine & equipment. But as such companies, there are some missing conditions. Most of them are the base of factory management...



—Before starting my teaching, we did the factory evaluation in my Factory Management Checklist. Then the result was 43% (43? Or 33?... Anyway it was very low.), and showed the necessity of establishing foundations.

—For instance, there is the item “Motivation” (Employee Engagement). If it is not sufficient, it is not possible to expect the share the sense of value and sense of “All people’s participation” with employees —In my heart, my biggest concern of this company is the turnover.

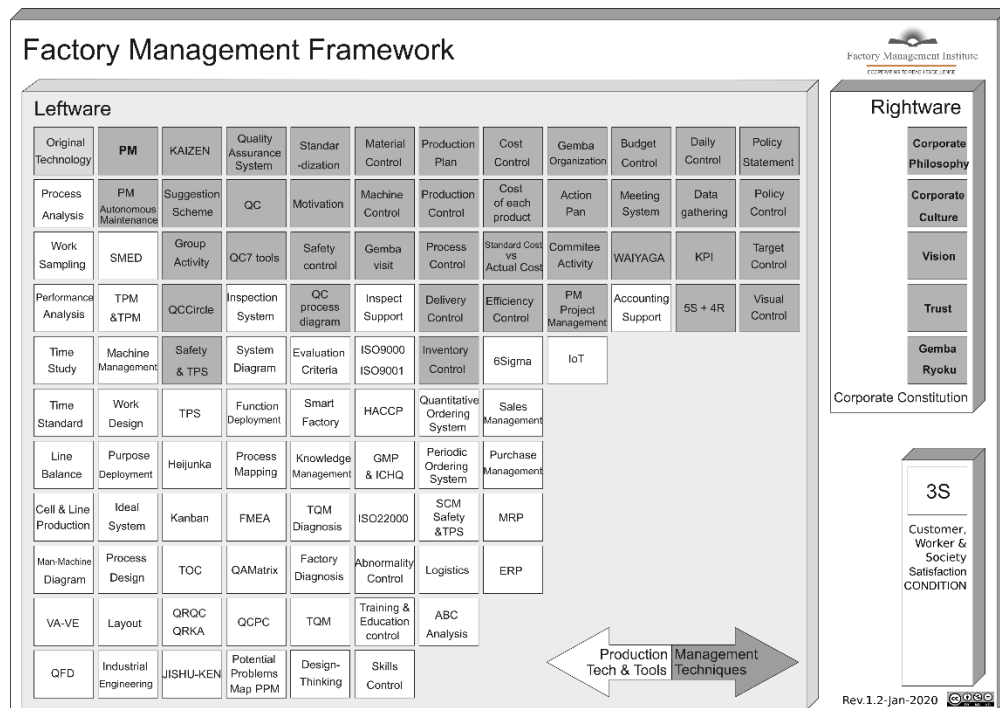
—In the original of JIPM TPM, all pillars aim at and have the word of establishing the “system”. Probably, you may understand what the meaning of “establishing system” is. And, the “T” of TPM is “Total”, Company-wide and “All people’s participation”. So, the establishment of the system!?... It is not only the consideration in office, but also is the preparation of the environment in Gemba...

—Therefore, I teach the 3 essentials, which are the Gemba involvement (5Ss, Committee), Management team, and establishment of the system.



### Again Factory management framework.

The dark shadow parts are the basic items:



—I taught 5Ss and the committee activity. And, the committee activity, there are subcommittees, which are Kaizen and Safety...

—In the safety committee, the regular safety patrol by Gemba people was organized. This committee aims to prepare a good and healthy working environment. They improved the working environment in for instance day-lighting, flowers, trees & plants, safety check-in working including tool & machine and method, air environment, etc. And in the notice board, there is the information of safety committee organization (3 months term), the checklists of 5Ss & safety, improved ideas, and necessary taking action. They aggregate the total result with each section’s 5Ss checklist.

—Now, one of the important things is that they are doing these activities spontaneously. I know that their activities are not the perfect situation, therefore, still, it is necessary the support of the observer (each manager) and project team. I can be optimistic about sustainability if you can maintain your interest and involvement. In this way, I intend to bring up Employee Engagement.

—The part of “environment” is the prevention of pollution and is a corporate responsibility. In PM, I have discussed this theme mainly the treatment of disposal oil. And I confirmed that the correct method is implemented for the treatment of not only the waste oil but also other disposal waste such as oily cutting chips and drainage. And, in the 5Ss activity, the activity which classifies the garbage and other production waste, office Gemba waste and provides cans and the procedure has been implemented. Now the Gemba mind to health & safety & prevention of pollution is high so far.

—And, why am I insisting the sustainability of the Management Team is? ...Because it is the key point of the fan. Unfortunately, a Gemba is fragile. Therefore, the activity of Employee’s Engagement by team’s knowledge & act is important. And, I recommend you to study the Requirement items of ISO 1400 and to organize them as a management item as the management team. It (Safety and Environment) is the must item. And I believe you can do it by yourself.

—Now, I finished the review of the 8 pillars which are the items you desire. I know that individual items are still not sufficient. And, from now the solution for deepening the activities is “time” and accumulation of experience. And your task is to maintain your interest and involvement as the management team. And, the secret of the introduction of TPM is Gemba **Management** and the **System**.

—I have explained the method of introducing and stabilizing new techniques such as TPM. Which is to establish the involvement of Gemba. Therefore, 5Ss and Gemba Committee are introduced and these help the improvement of Employees Engagement and “*All people’s participation*”...

—We established the organization of the Management team. In fact, still, it is necessary to accumulate experience. But I believe that you could stabilize the **Kata**...

—Finally, **System**... To stabilize such a system, one of the essential items of 3 is the “system”...

—The System is The flow of Policy & Strategy, Yearly Policy, Yearly Action plan & PDCA, KPIs & feedback, regular meetings & reviewing, and daily management by the management team and by the Organization. But I know, it is insufficient...

—I taught necessary **Kata** and supported that introduction. And, I believe that I finished teaching and introducing “T” PM. Particularly the part of “T” is important for your future activity including stability. However, it is owed by your keeping involvement as a management team. I think one of your concerns is stability. But, and again, it is a time-consuming issue and is the area of your effort...

—In next, let’s look at the activity result in the KPIs. We have introduced the indexes of machine performance and confirmed the result in these lectures.



## Machine Performance Index:

(From TPM-2<sup>10</sup>)

I started to explain to them all the Indicators —again...



### 1) Delivery Time Observance Rate (DTO rate)

$$\text{Delivery Time Observance Rate (DTO rate)} = \frac{\text{Actual Output}}{\text{Planned Output}} \times 100$$

**Actual Output:** Actual Production KMH

**Planned Output:** Planned Production KMH.

It is to observe the achievement of actual production against planned production. It must be never over 100%. Which is shown the overproduction and should be 100%.

From now, the data are the beginning week of data gathering and the most recent week:

**Beginning:** 118% (It is shown the over-production).

**Recent:** week: 100%

—It is possible to consider 2 things. One is strict to prohibit the overproduction (out of production plan), even if the material is remained or happening working idle time. Now it is kept the rule by the operators. And, another one is to be kept the rule or effort of covering the production delay by overtime, if the delay is small. But, but...

—Unfortunately, still, there 2 big illnesses that remained in the production planning.

—The first one is an operator must keep the production order quantity. But when occurring idle time due to being out of work by an operator, he asks for production planning to gain additional work which is not necessary to do at the timing...

—I confirm that you have agreed to introduce JIT Thinking when the project team made the slogan which is “Let’s make innovation” and “JIT Machine Condition” ... Yes? ...But unfortunately, the production department doesn’t keep this promise. Honestly, it is a shame...

—Another one is still too big a production lot size. The project team asked to minimize the production lot size. And as the first step, half month’s lot size was implemented which was still too and too big. However, still, the production department doesn’t move to the second step which is a one-quarter production lot size. I know, it is necessary to discuss this with the production department. But please understand that even if a month’s one-quarter production lot size, is still too big.

<sup>10</sup> TPM-2 (English): <https://archive.org/details/TPM2MudaInTheMachineryOfTheGembaKPIs2019a>

TPM-2 (Spanish): [https://archive.org/details/enat\\_TPM2](https://archive.org/details/enat_TPM2)

—Mr. Manufacturing Planning Manager —I call out—, your company has a high-cost constitution. And one of the roots of all evil is your department. When looking at the Pareto Chart of Defect Loss of machinery process, the top 3 causes are Setup mistake, Size setting (Dimensional) mistake, and wrong material used. And the cause of expanding the damage is too big production lot size. Production many and Disposing of many. It is your company...

—Why do you criticize me? —he asked me disappointed. Although, he continued his dissertation I prefer to go now just to the relevant conversation and omit some of the speeches...

—If so —continued the Manufacturing Planning Manager—, I will say that there is a case in which continuing production in using a little remained material is economical. In such a case, my department accepts to continue the production. Moreover, how do we treat the idle time of the operator? It is quite clear that the labor efficiency will be down.

In my heart. Still, such a manager remains. And then suddenly, I remembered the face of a person when finding the sub-assembly leads with no **Kanban** in the stand, he picked up these and trowed to us and shouted: "Connect the leads (return to the original state of cable)". And, it was a great threatening attitude. He said (shouted) —Still, you don't understand the meaning of **Kanban**. The cause was that a little cable remained in the cutting & crimping process. And the operator judged to use up it. Who was that person? ...Mr. K. Suzumura.

—Mr. Plan M. Once again... —I tried to explain again, and again.

Then, the Accountant Manager spoke to Manufacturing Planning Manager, and he explained him. —We decided to break up from the fake efficiency, didn't we? We decided to break up from disposal losses, which are caused by overproduction. Also, we decided to break up from fake labor efficiency. Labor efficiency or material efficiency must be judged with sales results. And the sales prospect is unknown at any time. Just because of a little material remaining, it must be never allowed to produce products which are in out of regular order quantity by additional labor cost, material cost, Inventory & control cost. And we must never use the managerial resources for extra production —and he finally concluded as next—: Also, we need to understand the necessity of smaller and smaller production lot sizes.

—OK, OK, please stop —I beg—. May I continue my presentation?...



## 2) Hourly Output

$$\text{Hourly Output} = \sum \frac{\text{Actual Output}}{\text{Machine Working Hour}}$$

**Actual Output:**  $\text{Actual Output} = \sum \text{Actual Products} \times \text{Standard Time}$

**Machine working Hour:** Hours of Machine Adding Value to product

It is substantial Machine Efficiency (%)

Unfortunately, we need to wait for the preparation or revise the standard time of individual products still. Therefore, this item cannot be confirmed.

But the Engineering department is proceeding with the revision of products standard time aggressively. Probably, it will be possible to use this KPI from next month.



### 3) Machine Performance Rate

$$\text{Machine Performance Rate} = \frac{\sum \text{Operative Hours}}{20 \text{ days} \times 8 \text{ hours} \times 2 \text{ shifts}}$$

**Operative Hours:** Actual machine working hours.

**20 days x 8 hours x 2 shifts (or one shift):** It is the meaning of wished hours against the investment.

And then, I pointed out —To observe the Efficiency of investment:

**Beginning:** 75%.

**Recent:** 62%

And I continued...

—The target machines include planned outage 6 machines. But actually, it is not meant to chase this index, because planned outage machines aren't used by the management decision, but for their reference.

—Got worse? —I asked myself—. There are good points and bad points. So, the good point is the reduction of excess production. At the beginning of this project, the factory constitution was "Making many and Disposing many". And your company chased the fake efficiency by spending managerial resources. And the result was 75%, Which is a high numeral, though including planned outage machine and is the meaning of unnecessary production existence...

—The bad point is the recent result (62%) shows the reduction of unnecessary production. But please, remember that there are still cases of overproduction. So the bad point... —I repeated—, it is the thing that you don't use fixed assets usefully. 6 machines are still in a planned outage. But, I would explain this issue later (Below excluding 6 planned outage machines).



### 4) Machine Operation Rate

$$\text{Machine Operation Rate} = \frac{\sum \text{Operation Hours}}{\sum \text{Planned Hours}}$$

**Operation Hours:** Hours of Machine Adding Value to a product.

**Planned Hours:**

$$\text{Planned Machine Working Hours} = \sum 8 \text{ (or 20) Hours} + \text{Overtime} \\ - (\text{Planned Stop} + \text{Morning Meeting} + 5S \text{ Activity} + \text{others})$$

—Your factory has (excess machines?) 6 planned outage machines. Of course, the above Machine Performance Rate involves all machines and such planned outage machines too. However, in this KPI, such Planned outage machines are not included.

**Planned Stop:** This is included the Planned Maintenance stop and Accidental Machine breakdown which requires a long-time expected stop and repair.

**Beginning:** 95%

**Recent:** 80%

—It is getting worse? ...No, not at all. When looking at the situation from machine usage, it seems to be getting worse. But you need to look at this from the managerial resources' efficiency. Of course, machines are also one of the managerial resources. However, machine efficiency from the point of view of managerial resources should be evaluated with the condition of JIT concept production...

—Now. This is the result of the changeover increase. As you know, initially, the production lot size was one ridiculous month.

### **One month lot size.**

—It was the quantity that was decided by the production planning department based on the inventory level and the uncertain sales forecast. And, it was the one-month bulk production orders. So, it was changed to half month lot size. Therefore, the changeover frequency was increased double and this KPI showed down.

—Now everyone, please understand that it is still ridiculous and too big. The project team suggested getting near to JIT and you agreed. Please challenge to week lot size. For the implementation, the next approach is necessary.

**Production Planning:** Small divided production order.

**Sales:** Negotiation of divided delivery.

**Factory:** SMED (Single Minutes Exchange Die: Changeover time reduction.) Please Break Away from the fake efficiency.

**Material:** Small lot material supply and handling control.

**Management:** Explain to operators to get their consensus. Probably it is the most difficult matter.

And then, the production Manager interrupted my speech —Kimura. You criticize my department as fake efficiency, don't you? ...Everyone, as you know my factory kept good efficiency. Moreover, based on the result, we could switch from outsourcing to in-house production. Still, you evaluate that it is fake efficiency? —and he continued his dissertation.

—Please calm down, Mr. Production Manager —I asked him—. I'm telling you that is still too far from sound factory efficiency. And I'm telling that your constitution is "Making many Obsolescence or Excess inventory" and as the result "Making many and Disposing of many"...

—Your production lines have no flexibility, because of too long LT as of too big lot size. You have many kinds of products. But unfortunately, "too big lot size" causes overproduction. Overproduction. Unfortunately, it is difficult to identify the proper inventory by individual product so far and near future for your company...

—Therefore, we decided the temporal standard as next: (Standard of my previous department)

**Obsolescence or dead stock:** No movement for 6 months and over

**Excess stock:** No movement for 3 months and over.

**Normal:** No movement less than 3 months.

—Also, we introduced the Inventory Turnover Ratio is one of the KPI. The results were:

$$\text{Inventory Turnover Ratio} = \frac{\text{Sales Amount/month}}{\text{Inventory Amount}}$$

**Beginning:** 0.1

**Recent:** 0.5.

—My previous department was 24. This is the meaning of almost one day stock against the sales amount. And your recent figure 0.1 shows 10 months inventory. It is getting better and the recent is 0.5 which shows the 5 monthly inventory against the recent sales amount.

—Mr. Production Manager —I begged—. For getting your better understanding, let's look at the reverse number. That is:

$$\text{Temporal Inventory Turnover Ratio} = \frac{\text{Inventory Amount}}{\text{Sales amount/month}}$$

And the results were:

**Beginning:** 10. It is the meaning of keeping 10 months inventory against one month's sales.

**Recent:** 5. Also, it shows the 5 monthly inventory amounts.

—Is the 5 months inventory the final figure? ...The answer is very clear and “No”... This level is still unusual and too far from sound factory management. Moreover, and But, But...

—Above inventory number is not included in the Obsolescence & Deadstock. And unfortunately, excess stock materials or products are moving to Obsolescence...

—Mr. Production Manager —I asked him—. Sales and Production planning departments are intending to improve the accuracy of sales forecasts. But there is a limit because of the inventory control & order accuracy capacity of customers. There are 2 facts which are: One is Uncertain sales forecast. Another is Make to Stock Production (with keeping inventory for quick response to customers)...

—But you need to maintain and improve your company. One of the solutions is to make it in the small lot. And you should break away from the fake efficiency.

—Mr. Kimura —Production Manager asked then—. Again, you told “fake efficiency”, did you. We are making effort to improve efficiency to reduce costs. Do you call our effort “fake efficiency”, don't you?

—Mr. Production Manager, Please no more —I begged him—. Because this is not my matter and out of contract. And whether you obey or not is your matter. But, one thing... Do you know that some parts you produced are more than 100 years inventory level?



### **SUMITOMO standard (again) and Supplementary Provision.**

Again, the definition of “Excess inventory” is Obsolescence or dead stock that means “No movement for 6 months and over”.

- **Excess stock:** No movement for 3 months and over.
- **Normal:** No movement less than 3 months.

*This standard is looked at from the movement (shipping to production Gemba from inventory).*

*My previous department in SUMITOMO has a supplementary provision. It is looked at from proper inventory standards. And the inventory standard is a maximum of 3 months against sales. And it is revised every 6 months. And excess inventory and even normal inventory are investigated the inventory level.*

*For instance, even normal inventory which is the result of movement within 3 months, the parts or materials which are more than 3 months inventory in standard the excess are judged to excess stock.*

*For instance, A material:*

**Normal stock (inventory): 1000**

**Average monthly usage in 6 months in sales: 200**

**Allowed as normal stock:  $200 \times 3 \text{ months} = 600$**

**Excess stock judged:  $1000 - 600 = 400$**

*These 400 stocks are separated on the same shelf but are put yellow tags. And, if these 400 have no movement in another 6 months, these are moved to obsolescence area with putting red tags, even though there are the usage result.*

—Going back to my presentation —I resume— ... 100 years inventory! ...You have many kinds of excess inventories. But as a feeling, it is ridiculous...

—Perhaps, the products which use these parts were the mass products in the past. And you made these parts in very big lot size. But unfortunately, these products are now very small order quantity which is one product within 3 months. These parts are still alive. But the inventory level is ridiculous. As you understand, the reason is too and too big lot size.

—Again and again —I repeated—, I need to suggest you break away from the fake efficiency. Your labor efficiency is calculated as next:

$$\text{Efficiency} = (\text{Number Product Produced} \times \text{Standard Time/Man Hour used}) \times 100.$$

—This figure is necessary to use for factory control. But, the True Efficiency must be calculated as:

$$\text{Efficiency} = (\text{Number Product Sold} \times \text{Standard Time/Man Hour Used}) \times 100.$$

—But there is the time lag between this calculation and above. Therefore, as convenient, the above calculation is used...

—Mr. Production Manager —I continued—. It is easy to increase your fake efficiency and not necessarily any **Kaizen**. Just do big lot size, which can eliminate the time of changeover. The machine stopping time is only the material supply and product take-out. And glimpse, your factory looks like profitable. Moreover, assets in the Balance Sheet are increasing. But actually, just bad assets are increasing...

—I said that your improvement is fake —I pointed out—. The reason is that you are producing unnecessary products. What the so-called unnecessary products are: One is the obsolescence & dead-stock. Another one is the timing. You are producing products in ignoring the necessary timing...

—You produce products which should be produced within, for instance, 3 months at once. And how about the evaluation in the P/L Statement. The result is positive in the column of Labour Cost Modification, because of the efficiency improvement with big bulk production. You need to understand that this P/L Statement style has a pitfall. It looks like that the more you produce in bulk, the more profitable you will be...

—And at someday, this obsolescence and dead stock are disposed of. Recently, you cannot treat such obsolescence and dead-stock. Because of the red increase in the accounting statement. Make dispose of such 100 years inventories! ...Because you cannot use these without additional control costs, which are the warehouse control cost and also re-inspection before shipping these...

—Everyone —I call their attention again—. When looking at KPIs, you need to consider from the point of view of multiple dimensions. Now again, **Machine Operation Rate**:

**Beginning: 95%**

**Recent: 80%**

—I believe that you could understand the meaning of fake efficiency or fake performance. And when considering the machine performance or labor efficiency, you need to decide the essential prerequisite —and I explained that prerequisite...

—As the prerequisite, Inventory turnover (of course normally, it is included an Obsolescence & Dead-stock and Excess inventory. But I suggested not to include these, but to calculate just “normal” stock.) must be decided the target. And, for achieving this target, it is necessary to decide the production lot size and inventory turnover...

—At present, the production lot size is still half month bulk against the monthly production order by the production planning department. It was improved from the initial stage which was one month lot. And, I suggest the next step which is a one-week lot size. I know that from one month to a half month was a big challenge. And, I know that one quarter is a big challenge also, but I need to recommend its challenge.

—Wait a minute Kimura —joint the Production Manager—. Is this for all products?

—Of course, yes.

—It is ridiculous —affirmed the production manager—. There are many kinds of products which the production orders are less than 10. For instance, if the order is 4 products/month, do you require 1 production lot size? ...Producing just one and changeover!?

—Of course, yes.

—Everyone —Production Manager said—, I believe you understand that it is ridiculous. It is easy to imagine that labor and machine performance should become the worst status. Ridiculous. Indeed ridiculous. As you know there is the “Economic Lot Size”. It is ridiculous that produce one and make a changeover. The result is very clear and most of all machine stops and occurs capacity shortages. Kimura —he asserted—. Do you intend to destroy labor & machine performance?

—Please think carefully —I try to explain again, and again, and again with patience—. Why do you need to improve Machine Performance Ratio? ...It is easy and is to improve machine efficiency. Then why do you need to improve and maintain machine efficiency? Of course, it is for your wish and profit recovery. Yes? ... Is your status of “Making many and Disposing of many”, is it your wish? ...Mr. Production Manager introduced the word “Economic Lot Size”.

### **Economic Lot Size**

—Everyone, please understand —I called their attention—. Economic lots generally consist of “inventory maintenance costs” such as interest rates, insurance, taxes, storage costs, and obsolescence costs, manufacturing office work costs, machine stoppages due to machine setup (including removal work), and material loss. Considering the balance with “setup cost”, it means the quantity that minimizes the total cost...

—However, economic lots on the premise of large lots are not a good idea. Your factory handles many parts. Moreover, in the age of high-mix low-volume, various parts change. In order to respond to such switching of varieties, reduce inventory investment, and improve the turnover rate and profit margin of management capital, it is desirable to have a small lot system as much as possible. For that purpose, it is also important to shorten the LT, and manufacturing with a small turn is required. When considering not only a single process but also the entire factory and the entire company including sales, a smaller lot can be said to be an economical lot.

—Machine capacity shortage? ...Mr. Production Manager —I asked him—. Please use the 6 machines which are in the planned outage. So, the reason for the machine’s planned outage is the judgment of overcapacity, which is calculated based on the current lot size production order...

—At this point, I may express three things —And I pointed out them using my fingers—. The first one is that these machines are also the subject of fixed cost (depreciation). Therefore, there is the cost, even though not to be used. The second one is for the new challenge. As Mr. Production Manager pointed out, the Machine Operation Ratio will be worse. Therefore, it is necessary to supplement the machine capacity up to improving SMED...

### **Labor capacity.**

—It is necessary to create the necessary number of operators, by no additional employment as far as possible but is necessary to hire some. In this way, the labor capacity of current machines to be used. As shown next, you have abundant labor capacity.



Finally, I explained the third one —the third one... Yes... Mr. Production Manager. You accepted to make a trial of small-lot production by the project team, didn't you? ...Then they could have the chance 7 times.

—No —Answered the Production Manager—. I have not allowed them such trial —And he continued his justification.

—Stop please Mr. Production Manager —I beg him—. I explain this in the item of Breakdown Rate. Therefore, please wait—. Now again —I told everybody—. The Machine Operation Ratio and Labour efficiency will be worse. Nevertheless, this number is your true current machine performance capacity and labor efficiency. After the implementation of the third challenge that is the quarter month lot size, you will be able to stand the start line as a normal company and you decide the target of KPI and improve.

In addition, as I wrote above I continued my speech in the same way—Now you have excess machine capacity by the six planned outage machines. So that, please use these planned outage machines (fixed cost). However, please, —I beg again kindly— think carefully. Why do you need to improve Machine Performance Ratio? ...It is easy and is to improve machine efficiency. Why do you need to improve and maintain machine efficiency? ...Of course, it is for your wish and profit recovery. Is it correct? —I asked him.

—But please think —I emphasized the word “please” before the enumeration—. —**Firstly, can just seeking Machine Performance Ratio contributes to your wish?** ...The answer is No. It was already shown in the past data. Moreover, there is a negative chain...

—The negative chain is that you seek a better Machine Operation Ratio in Big lot size. And, this big lot size calls long LT. Long LT calls the increase of Inventory. In addition, this increase in Inventory causes an Increase in Obsolescence & Deadstock. In addition, —I pointed out—, this negative chain causes big disposal with the case of a quality defect as a Setup mistake, material wrong. In addition, the old inventory requires an additional inspection before delivery...

—**The second one is, my suggestion is to shorten the LT.** In addition, to shorten LT, I suggest you reduce lot size and use 6 machines. It is necessary to provide additional operators and machines to pursue shorter LT. Moreover, please, teach small lot production, frequent changeover, and best changeover SMED to the new operators when you hire them.

—By the way —I broke my argumentation for a while—, I wish to supplement operators and machines.

### **Current machines and operators.**

—Your operators who operate a current number of machines have abundant time allowance. Please look at the next diagram, which is the Pie-Chart and so-called **Man-Machine Chart** made by the project team:

**Machine working is 80 %** (Machine Operation Rate).

**Machine stop is also 20%.**

The middle circle shows the movement of the operator. And,

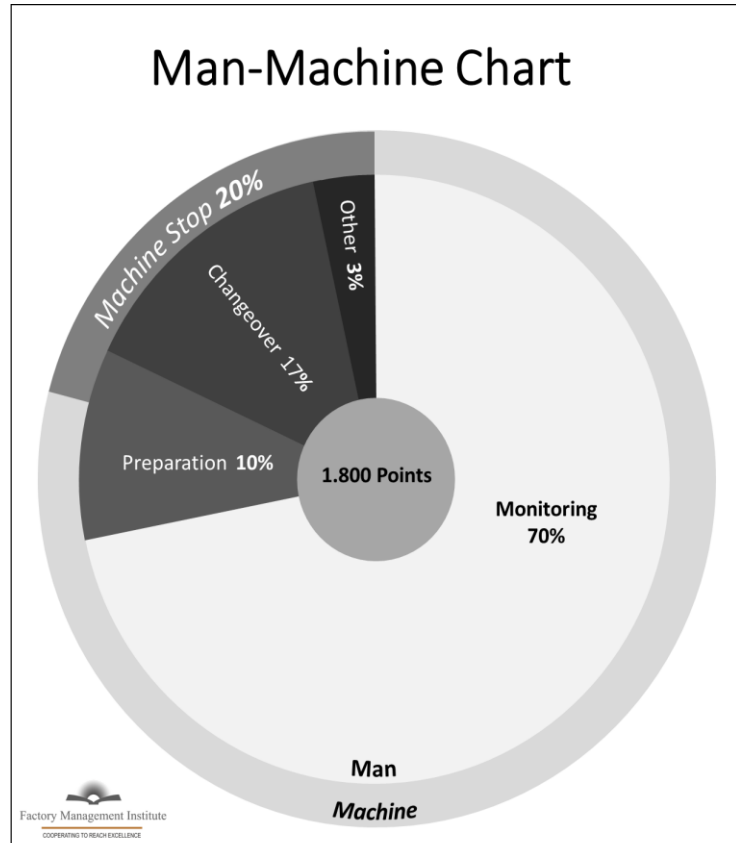
**Monitoring is 70%.**

**Preparation is 10%**, as works for next work such preparation of material, die tool, etc and including product removal

**Changeover is 17%.** And,

**Other is 3%**, as something job and idle time

—“Monitoring” is 70% working contents when the machine is moving. Moreover, In my experience, such kind of machine has advanced automatic devices. However, the main job of this operator is “Monitoring”. It is a very much abnormal scene. Such an abnormal scene is not just your factory, but to be seen in many factories. And, in this way, there is a very interesting picture shown next.



I know that it is not meaningful to compare the above 100 years old machine and the present one because the complexity is quite different. However, the usage of the operator should be learned.



Figure 1: Above is the photo of an active textile factory, at 2021, which still uses a number of Toyoda Jidou-Shokki (Gtype Toyoda Automatic Loom 1924 by Toyoda Sakichi)



—Everyone please—I call their attention again—. About your machine. Your machine has the function of automatic stop when finished the work and also occurred irregularities which cause to product quality.

Then, you need to use this human resource more usefully. For sure, you understand my saying. Moreover, I am suggesting more often changeover. In addition, it is possible to do without increasing operators. Indeed, another automatic stop device may be necessary, if you challenge Monitoring free. However, it is not sound like such 70% monitoring to be left.

—I do not say the implementation of complete monitoring is free, but I'm saying that it is possible to increase changeover frequency with nothing to do.

Perhaps, the operators resist when the decision is made. According to my experience, the resistances are for instance work sabotage, intentional working delay. Nevertheless, it is necessary to implement because it is necessary to resolve the unfairness of workload. Is operator a privileged class compared to assembly line workers?... It is quite clear that there is an unfairness in workload.



### **One minute Work Sampling Method.**

*Now briefly, even I will explain it in more detail in another opportunity.*

*The project team made a work-sampling survey. Moreover, the method is one-minute work sampling.*

*The one-minute work sampling method is very convenient. In addition, probably, no textbook introduces it.*

*The purpose is the same as the normal IE method's work sampling. In this way, the process is:*

- 1) *To determine the subjects and range.*
- 2) *To Investigate and understand the work contents of (for instance) operators.*
- 3) *To determine the work content code. When making is survey there is no time to record in detail description but just working code.*
- 4) *To decide the term and members and points. For instance, in the previous example:  
By 6 members. 5 days. Therefore,  $6 \times 60 \text{ minutes} \times 5 \text{ days} = 1,800$  points/machine.  
This team surveyed 10 similar jobs machines by one person.*

*Then, the total gained points were 18,000 points. And, the chart shows the average.*

*1-day 1-hour, 5-days chosen and implemented by 6 persons.*

*The days of "5 days" were chosen in random sampling.*

- 5) *To start monitoring and record. Actually, it is not "monitoring", but to look at a glance and record the work. Therefore, it is not the work content of one minute, but a momentary record.*
- 6) *Making Pie Chart.*

*There is a definition to separate human work:*

- ✓ **Subject work:** *It is necessary to stop the machine when doing.*
- ✓ **Incidental work:** *It is not necessary to stop the machine when doing.*

*It is indeed hard work. The person is required to walk around the (for instance) 10 machines, distinguish the machine movement and operators' work, and record in the survey sheet in one hour.*

*When I was young, I got training in SUMITOMO Electric. At that time, I was required to survey 5 machines x 8 hours x 6 days.*

*Walking around 5 machines and recording in one minute (5 machines and 5 records of machine movement and operator's work content). Yes, while 6 days, I was walking. It was so hard training.*

*Was there its necessity?...No, but it is just training the body.*

*Now. In the IE book, there is a calculation of Probability Theory. However, in most cases in factories, there is no necessary such somewhat difficulty to understand the factory situation. Therefore, I recommend and teach this One-Minute-Work sampling method to survey machine condition (moving, stop, breakdown, waiting-stops) and operator's movement (material preparation, die tool preparation, treatment of products, Seiso & others, idle time).*

Going back to my presentation.

—Finally, everyone — I remarked—. Sound management is in a sound inspiration. The meaning is to consider the phenomenon in multiple dimensions. Machine Operation Ratio became worse. Nevertheless, please think in multiple dimensions. —Ah, I was tired but there are still four items... I thought.

—Mr. Production Manager. Again —I call his attention again—, this is your matter. To implement my suggestion or not to do is your matter. In addition, this suggestion is out of my job contract. So, can I move to next? ... —I finally asked everyone.

—OK. Next is Machine Performance with Speed Rate.



## 5) Machine Performance with Speed Rate

$$\text{Machine Performance with Speed Rate} = \frac{\sum \text{Number} \times T / E \text{ Speed}}{\sum \text{Planned Hours}}$$



**Number:** Actual output produced.

**T/E:** Time (or Hour)/Estimated Output: Estimated Production Time per piece. The unit is Time (Hour)/Piece.

My previous department uses 80% of catalog speed for this number as the first step.

**Number x T/E:** The producing time required with catalog speed. It is an ideal production time by keeping catalog speed.

—Now, this is not implemented — I remarked—. I explain the necessity of this KPI. Long years ago, one thing had been recognized as a problem in a monthly factory (review) meeting. At that time, the KPIs for monitoring machine performance were:

- ✓ Hourly Output;
- ✓ Machine Performance Rate;
- ✓ Machine Operation Rate;
- ✓ Break Down rate;
- ✓ Machine Stop Frequency Rate and;
- ✓ Changeover Time.

—Moreover, as you understand, and **Machine Performance with Speed rate** was missing...

—A strange thing was happening in the factory and a machine. An operator and his machine recorded a very excellent record of Machine Operation rate, but bad Hourly Output. Other indexes were normal or a little better. Nevertheless, the Hourly Output index was extremely bad. Then, a production engineer investigated the cause.... However, before going to the answer —I broke my argumentation...

—Once again, Hourly Output. I said that it is like "*substantial machine efficiency*". And, it is calculated as next:

$$\text{Hourly Output} = \frac{\sum \text{Actual Output}}{\text{Machine Working Hour}} \times 100$$

**Actual Output:**  $\sum \text{Actual Products} \times \text{Standard Time}$

**Machine working Hour:** Hours of Machine Adding Value to product

It is, indeed, substantial Machine Efficiency (%)

One of the most difficult problems was the *Standard Time*. Please, imagine the Wiring Harness. In a vehicle, more than 2.000 electrical circuits are stretched around. And, these circuits are processed with an automatic cutting-crimping machine and of course, all these circuits are of different lengths and with the variation of cable kinds...

Therefore, it is almost impossible to decide the Standard Time for individual cutting lengths that the lengths are from, for instance, 10cm to 300cm. Therefore, the standard was decided with two elements, which were "average length" and cable kinds...

A weird thing happened then; This experienced operator was choosing works of same size & kind of cables, same terminal (for minimizing changeover) and "long cutting length", moreover "reduced the machine speed" for his comfortably working...

Now I resume the history of the company... —Your factory is similar to my experience and has many kinds of products, which are different shapes. Therefore, we decided to use average processing time by data collection as the Standard Time. In addition, as you know, to seek better accuracy, we introduced a matrix which is constructed of similar products, sizes, and materials...

—Here, please understand —I beg them— that the characteristics of these indexes. Hourly Output and Machine Operation rates do not show the machine performance exactly. The Standard Time is numerical average, which includes idle time, downtime, and operator working allowance...

—Therefore, it is necessary to see the machine efficiency from the point of the machine its-self. Then, I recommended introducing this index Machine Performance with Speed rate. Therefore, the preparation was done by production engineering. However, the implementation was still pending. There are the words by managers and they say that Mr. Kimura requires lots of data gathering and I am fed up.

—I can suggest the correct way, but cannot force to do —I admitted —. It is your matter to do or not to do.

—Kimura —joint the Production Manager—. Still, I cannot understand. I can understand the words of managers. Recently, operators have also expressed their complaints. And one of them is the job increase of record. I think it is necessary to let them concentrate on the original job.

—Now —I continued—, each machine has a computer to record the work contents. I understand that it is necessary to improve the workability of the record still. In addition, the IT department is improving it. Mr. Production Manager —I tell him—. You wish to improve Labour Efficiency and Machine Efficiency both, don't you? —I asked figuratively...

—You introduced the complaint of the operator regarding the increase of record. However, again please look at this Pie-Chart. Most of the time of your operator working is "Monitoring" which creates nothing. Of course, I never say that all "Monitoring" can be eliminated. However, the ratio is too much. You can improve the operator's labor efficiency with no investment. One of the difficulties is the resistance of operators and to guide them to normal working contents. Of course, they have sufficient time allowance to make the record on the computer...

—Mr. Production Manager, you expressed your thought of new higher-speed machines introduction and replacing current main machines. You wish to improve the machine performance, don't you? —I asked, again, figuratively—...But In fact, it is easy to do it.

—May be, I am right — I guessed—. I think your current machines do not exert possible capacity. Sorry, I have no back data, but in my experience. Perhaps, it is possible to increase speed by 20% with nothing. We are now talking about TPM. You can increase machine capacity with nothing. Easy. Please increase machine speed little by little. Please investigate the catalog speed. Mr. Engineering Manager —I pointed out—, please consider the improvement current machines' capacity rather than the thinking of new machine introduction.

In my heart, I felt as I usually did, a Catalogue engineer was fake or bastard! ... —A machine is exerting the possible capacity, or not. In addition, it is necessary to monitor visibly. Therefore, this index is important.

—May do I go forward? ... Any question? ... — I asked them—. OK, then, I go forward with the situation of Machine Breakdown.



## 6) Breakdown Rate

$$\text{Breakdown Rate} = \frac{\sum \text{Machine Stop Hours in Breakdown}}{\sum \text{Planned Hours}}$$

—Here, I would clarify again the definition of Breakdown and Choko-Tei. In this way, as you remember, I taught the definition of Breakdown as next. (From TPM-2<sup>11</sup>)

**Breakdown:** Stopping in some machine trouble for more than 15 minutes.

**Choko-Tei:** Stopping in some machine trouble for less than 15 minutes.

—When occurring some machine trouble, firstly the operator's skill, which is to identify the trouble to be “Choco Choco Trouble” or serious trouble, is required:

- ✓ **Choco, Choco Trouble, or Choco-Tei:** Toyota word.
- ✓ **Choco:** Not serious but frequent.
- ✓ **Tei (Teishi):** Stoppage.

—This is my previous department (Sumitomo Wiring Systems) standard. In addition, other indexes are based on the operator's computer record. However, the maintenance technician records just this. Therefore, the process is as next:

- Trouble occurred.
- Operator turn on the red sign of Andon.
- The Technician and the leader come to the machine.
- The Technician starts to maintain and finish.
- Operator & leader check the machine situation and quality and production restart - Technician records the time of Andon turn off and maintenance finish.

—This is the process of Breakdown treatment. Now probably you may doubt about the time recorded, which is included the time from turn on red sign to technician start the maintenance. Including *waiting time*...

—When I visited your factory, we made a factory tour. And, I saw the scene that an operator was waiting for something and the machine was stopping. Probably, the machine had some trouble. In addition, we saw that this machine was stopping at the return route. And I guessed that probably this machine was stopping during our factory tour. Almost one hour, this machine was stopping and the operator was waiting with nothing to do...

—And, of course, such waiting time also is included in "Machine stop Hours in Breakdown", even if the machine trouble was very minor trouble and Choko-Tei level. As you understand, this index is monitoring not only the machine level but also the activity level of the maintenance department. If it is bad, the maintenance department is seen as trouble. This index is the result sheet of the maintenance department...

—Now, the result is

<sup>11</sup> TPM 2 Muda In The Machinery Of The Gemba & KPIs:

<https://archive.org/details/TPM2MudaInTheMachineryOfTheGembaKPIs2019a>

TPM 2 - Muda en la Maquinaria del Gemba y los KPIs en el TPM: [https://archive.org/details/enat\\_TPM2](https://archive.org/details/enat_TPM2)

**Beginning: 8%.**

**Recent week: “?”.**

—Recent week: A question mark? —I repeated—. There was a good story. The project team and the **Gemba** operator group leader discussed a countermeasure when stopping a machine. And the idea is to utilize the planned outage machine. So, the job cycle of the leader is:

- Machine trouble occurred.
- Turn on Andon
- Identify **Choko-Tei** or **Serious Trouble**:
  - If **Choko-Tei**, Supporting the operator and quick recovery.
  - If **Serious Trouble**, the troubled machine stop.
- Set up a planned outage machine.
- Re-production start.

—It is a good idea to utilize a planned outage machine. But unfortunately, the time required which from trouble & stop to re-start wasn't recorded. Because the maintenance technician wasn't asked for the quick repair for this troubled machine by the operator...

—Initially, the project team planned just useful utilization of planned outage machines for seeking shorter LT. The initial thought was just shorter LT by increasing production kinds. And on one occasion, they got the chance of producing a very small lot, which was only 3 pieces but urgent production. The machine which was producing the product stopped, because of the machine trouble. Then, the group produced this very small lot with monitoring the planned steps...

—The steps were —I detailed—:

- Stopping the troubled machine and the production in the middle of production.
- Setup and start production of this small lot with a planned outage machine.
- Starting production and completion.
- The changeover to original machine (stopped) production.

—And fortunately (or unfortunately, because of machine trouble), they got such opportunities 7 times. Throughout these opportunities, they found the possibility of smaller lot production by the quicker changeover.

—The quickest record of changeover time was 8 minutes and it was SMED (Single Minute Exchange Die).

The "8 minutes" of changeover time is never surprising. I wrote the SMED example of Toyota Motomachi. This plant changeovers the large Die within 8 minutes. Therefore, the 8 minutes record is never surprising. On the other hand, the current changeover time situation which is more than 1 hour is a very surprising thing. (From Making stream of production-13<sup>12</sup>).

—Mr. Production Manager —I pointed out—. You wish to improve labor efficiency and machine efficiency. But your higher execute priority is to change the abnormal production by the

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<sup>12</sup> Making the stream of Production: [https://archive.org/details/makingstreamofproduction13\\_202001](https://archive.org/details/makingstreamofproduction13_202001)

Establecer la Corriente de Producción:

[https://archive.org/details/establecerlacorrientedeproduccion13\\_202001https://archive.org/details/establecerlacorrientedeproduccion13\\_202001](https://archive.org/details/establecerlacorrientedeproduccion13_202001https://archive.org/details/establecerlacorrientedeproduccion13_202001)



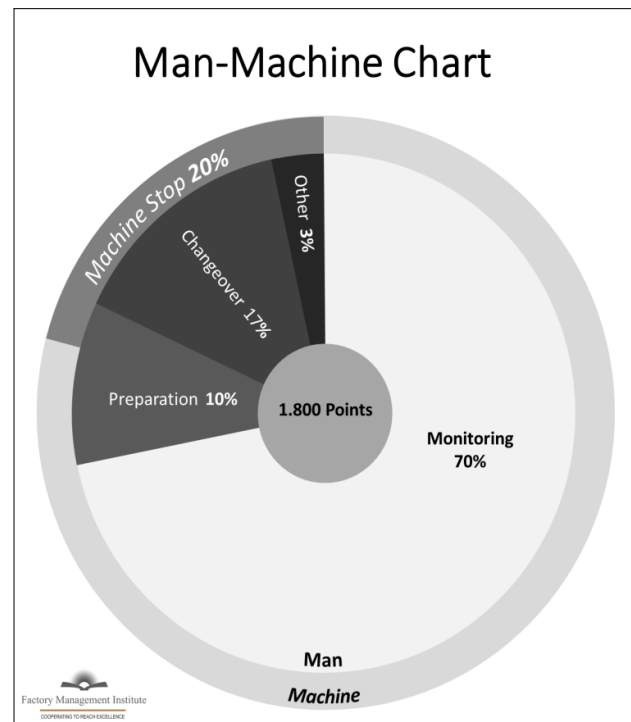
implementation of smaller lot size by the quicker changeover. And, it is no meaning to chase such indexes in the condition of abnormal production (too big lot size).



—The project team planned to change lot size from half month's volume to quarter month's volume as the third target. But it hasn't been implemented still. Once again, please look at the Pi- Chart.

—The project team planned a smaller lot size than the quarter month's production batch size as next by the condition of 2 machines-one operators. It is possible, even if it is in a smaller lot size, which is a quarter month's lot size. But I suggested they stop the thinking of 2 machines by one operator at this moment, because of the possibility of resistance of operators.

—Machine Breakdown rate is one of the essential indexes. And, the preparation is already done. Unfortunately, the data aggregation couldn't be in time. But the system is done already. And you can gain the data from the next management team meeting.



## 7) Machine Stop Frequency Index

$$\text{Machine Stop Frequency Index (MSFI)} = \frac{\sum \text{Number of Machine Stop Frequency}}{\sum \text{Planned Hours}} \times 100$$

This index is to monitor the **Choko-Choko** Trouble which is the so-called **Choko-Tei**. And the definition is:

**Choko-Tei:** Stopping in some machine trouble less than 15 minutes.

**Beginning:** 17.5%.

**Recent week:** 5%.

The number of Machine Stop Frequency includes the case of Breakdown too. And, this index is much improved. Indeed, it is the effect of PM (Preventive Maintenance or Planned maintenance system).

One of the causes of production planning turmoil was this frequent **Choko-Tei**. These stoppages were almost **Choke-Tei**. However, the operators were required to call maintenance technicians, and it was caused the machine stoppages and long time waiting, even though these were the level of **Choko-Tei**. But it is much improved.

This index is calculated as next:

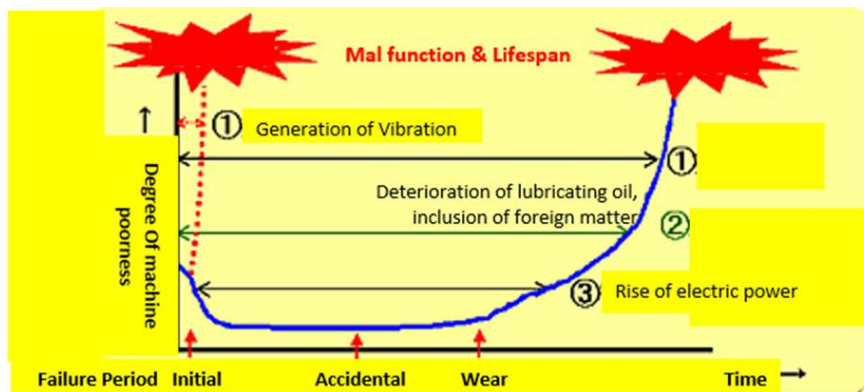
- **Choko-Tei per machine:** 7 times per week, Machine = **28 times / month**.
- **Planned hours:** (8 hours/day, shift) x 20 days/ month = **160 hours/ month**.
- Then, **MSFI** = (28/160) x 100 = **17.5%**.

This 7/week was improved to 2 times/week. And, in the same calculation of **Choko-Tei**:

- **Choko-Tei per machine:** 2 times per week =  $2 \times 4 = 8$  times / month.
- Then, **MSFI** =  $(8/160) \times 100 = 5\%$ .

—The result of the recent week was 5%. However, still too many.

—Everyone, please —I pointed out and remark—. Please, understand that this numeral is still not normal, even though it was much improved. This numeral must be less than 1%. Your main machines are 10 or less than 10 years old, are they? ...And these are still young and in the Accidental range in the Bathtub curve:



—They are possible to exert sufficient capacity if you continue current PM activity. And, there is no necessity to replace them with a new high-speed machine. **Choko-Tei** is a baby of serious Breakdown. And, our target level is under 0.0...

—Now —I broke my argumentation—, this Machine Stop Frequency Index has the task of not only monitoring the health of the machine and maintenance department but also involving operators in factory management. In this way, other indexes are of course important. But it is difficult to share the information with Gemba operators. We desire to involve them in factory control. However, others are calculated by a computer and are far from the sense of operator feel...

—On the other hand, this index is easy. Just recording the occurrence by manual. Making the graph also is easy...

—Everyone. I challenge the stability of 3 dimensions which are Gemba Involvement, Management team establishment, and System introduction when I teach a company. And to involve Gemba, I provide Committee and Kaizen, 5Ss and provide the opportunity of making graphs by themselves. Then...

—The providing graph & recording the machine stop frequency by the operator also is the opportunity to involve them in TPM. Just this, they can understand the meaning with their sense of feeling. And it is the first step to involve them in Control Graphs...

—Mr. Production Manager —I call his attention again—, you told me the operator's complaining about the increase of recording. But I recommend you to keep this graph recorded by operators themselves. OK?... —I asked everybody—. May I go final one? ... So, final one is Changeover Time.



## 8) Changeover Time

$$\text{Changeover Time} = \frac{\sum \text{Changeover Time}}{\sum \text{Number of Changeover}}$$

**Beginning: 51 minutes** (By project team Work Sampling investigation).

**Recent: Pending...**

—Pending? —I asked figuratively and surprisingly— Yes, the situation is still pending. This is a system of reporting one's achievement. The report is the time from stopping the machine, treatment of current product and materials, new setup and to start for next product.

—In this way, the operator needs to record the time of stop and re-start and also the number of changeover times. It is never a difficult, or complicated matter. But, unfortunately, we couldn't gain the operator's cooperation.

—Everyone —I pointed out—. Shortening of Set-up time (SMED) is an essential activity for not only the labor & machine efficiency improvement, but also for shortening LT and smaller lot production. But as you understand, any activity has required the cooperation of **Production-Gemba**. And, we could establish a good relationship in most of the Gemba. But unfortunately, we couldn't establish the relation of "All people's participation to management & sharing the sense of value" with a few parts of machine operation still.

—They are thinking that our TPM activity is related to labor strengthening. Again —I tried to explain again the main target—, please look at the Pie-Chart. The operators have too many working (time) allowance. For them, it is one kind of work strengthening to require a normal working (time) allowance. I know that we are acting very aggressively in a relatively short period. Even though normally, it is required a longer period to establish TPM in the condition of which particularly the condition of very low Employees Engagement, you are required the rapid profit recovery by your president, aren't you? —I asked even I didn't wait for the answer.

—Your biggest enemy is time —I remarked—. Your biggest loss is the Obsolescence & Deadstock, Over (excess) production, bad inventory turnover, Quality and number of inspectors, too long LT. It is the essential condition to gain a good understanding by the operators and is not mine, but your important task.

—SMED activity —I broke my argumentation—. It is, indeed, one of the important activities as the JIPM book highlighted it, and is necessary to add in management items. And, the key to management is visualization...

—Establishing the changeover time record and utilizing is essential. Please, implement it by persuading the operator group.

—Any questions or doubts about this item? —I asked finally in order to conclude— Everyone, do you accept my presentation contents?... If there is nothing, I finish my final presentation. Thank you very much for your kind attention —I said, feeling that indeed, they listened very calmly, even if it could exclude the Production Manager who growled and showed obvious discomfort.

—Mr. Production Manager. You have something question, haven't you?... I asked supposing, indeed, he had some doubts according to his gestures.

—Yes, Sensei —broke the tension the Accountant Manager—. We do with many thanks. And Mr. Production Manager has a question. And, it is How about the 12 steps?... Mr. Production Manager and some managers doubt not using Nakajima's 12 steps.

—Ha, Ha, Ha. I' sorry. But... —I tried to explain calmly— Probably you have visited a medical doctor, haven't you?... A general disease can be treated with a routine procedure. However, if it is complicated, the treatment process and steps are considered and planned. And, the procedure is not like routine but is like a special order...

—Your company has a disease. Therefore, you wanted to introduce JIPM TPM. Anyway, you persisted in it. Now I don't make my comment that your persistence is matched to your final desire or not. But I can say that now you have already started the activity for your final desire also finished the essential base throughout the TPM introduction and project activities...

—But 12 steps!? —I asked myself again, and even I had no intention to answer myself again, I tried to make a new effort—... It is ridiculous to persist in it. The 12 step is just one example to be not good...

## Nakajima's 12 Steps

—Again. Your company has the disease which is the lack of factory management base and as the result, is a very high-cost constitution. In fact, such companies are many. But each company has its own factory condition, products, corporate culture, and scale.

—Therefore, it is necessary the construction of plan in deep consideration and diagnosis.



**Nakajima's 12 steps<sup>13</sup>. (From TPM-2). I present his material in faithful translation.**

Nakajima's 12 Steps		
Step of Introduction Preparation		
1	Declaration of TPM Introduction by Top	Declaration in Management Team Meeting and Board Meeting. Declaration in TPM internal course
2	TPM education and Campaign	Managers: Course and camp for individual class managers
		General employee: Declaration in employees' course in VTR.
		Declaration in leader's education and internal course
3	TPM promotion organization and staff organization model	Setting the committee, specialty subcommittee, and secretariat Deployment of the staff organization model
4	Establish basic TPM policy and Goals	Management goal, Activity target, Clarification of activity policy BM setting, and creation of kaizen theme in Loss investigation
5	TPM deployment master plan	3 years master plan, Yearly base, quarterly base action plan, and Monthly base schedule

<sup>13</sup> TPM-2 (English): <https://archive.org/details/TPM2MudaInTheMachineryOfTheGembaKPIs2019a>

TPM-2 (Spanish): [https://archive.org/details/enat\\_TPM2](https://archive.org/details/enat_TPM2)



Step of Introduction		
6	TPM Kick-off	Re-declaration of the policy to customers and suppliers (Invitation for customers and suppliers)
Step of Introduction Implementation		
7	Establish a system of Effective production department	Chasing the limit of effective production
7.1	Individual ( <i>Kobetsu</i> ) <i>Kaizen</i>	Project team activity and small group activity
7.2	Autonomous maintenance	Step method, Diagnose and certificate
7.3	Planned preventive maintenance	Betterment preventive maintenance, Regular preventive maintenance, and preventive maintenance
7.4	Education and Training	Group education for leaders and Transmission to employees
8	Establish Development & Management system of Products & Equipment	Chasing easy-to-make products and easy-to-use equipment
9	Establish a Quality maintenance system	Condition setting that does not cause defect and maintenance
10	Establish a System of effective administration and indirect departments	Production support, streamlining own department, streamlining equipment
11	Establish a Control system of health & safety and environment	System of 0 accident & disaster and 0 pollution
Step of fixing		
12	Implement TPM fully and level up	Challenge higher goals than an audit of TPM award of excellence

Then, the Human Resources manager asked —Mr. Kimura. We read the books of Total Productive Management and learned. In the books, of course, this Nakajima's 12 steps are introduced. Also, the effects and success are introduced. Why do you tell us that it is no meaning?

—Mr. Human Resources Manager, there are 2 misunderstandings. One is that such companies had the base of basic factory management when challenging to introduce it already. On the other hand, you hadn't its fundamental base. Your company is like a giant baby who grew up just body. Probably, there might have been a period of growing very rapidly in the past. Anyway, your company's level was quite low like as shown in the Factory management Checklist diagnosis (33%).

—Another misunderstanding is that the introduced companies are to be gaining profit by mainly the implementation of basic factory management and not the implementation of JIPM TPM. A certain level company intends to improve more. Then, he plans a companywide action and plans to challenge (for instance) TPS, ZD Activity (Zero Defect Activity), TPM, etc. A company might have had been a disease. However, it should have been true that the company had a certain level of factory management.

—Now —I tried to finish—, Nakajima's 12-steps. (From TPM-3<sup>14</sup>):

<sup>14</sup> TPM-3 (English): <https://archive.org/details/TPM3PreventiveMaintenance>

TPM-3 (Spanish): <https://archive.org/details/TPM3MantenimientoPreventivo>

## Step of Introduction, Preparation

—This first stage (1 and 2) is your favorites, which are brain masturbation and festival. I believe you have had known that your company had something of basic fault. It is indeed, there are amount of sales and kinds of products. However, unfortunately, the **Gemba** participation and share the sense of value with corporate management was very poor. You knew that. Nevertheless, you started based on the 12 steps. It is indeed to be fun to make a plan like a future dream. Therefore, I call it brain masturbation by specific persons (Sorry bad word).

### 1) Declaration of TPM Introduction by Top.

### 2) TPM Education and Campaign.

And Continuation the brain masturbation in office without production & office Gemba.

—To whom, did you make the education?... The step of education is important. However, you lost the opportunity to involve the Gemba's operator. To educate Gemba's operators, the effective method is OJT (On the Job Training). Who are the Champions?... Was there a proper condition to involve Gemba such as Employee Engagement (Motivation) improvement?...

—Later, there is the item of "5. TPM deployment master plan". And, it is required to make 3 years master plan. Did you make it and which is the Motivation Improvement (All people's participation) involved?... Which is the most difficult item, and long time consuming and is the meaning of culture change for your company. Therefore, I introduced the Committee activity, Kaizen, QC Circle & Group activity, Safety, and 5Ss. These are the technique to educate and bring up the mind of "All people's participation".

—Education!?... To Who & by Whom, In Where, When, What (contents) and How?... Education is important. But there are 2 types of education which both are essential. Firstly, Education in office. It is useful for bringing up long-term strategy. On the other hand, it has no immediate effect. In somewhere, I have written regarding Kaizen. Moreover... Education first? Or Action first?

—The answer is not Education first. But Act first in Gemba. And, never misunderstand the word "Action first". So, the word "Action first" I wrote is that "make the system". And, what is the system?... It is Evaluation & Award, Giving a chance to make Presentations, Notice board, and support to create Gemba's ideas. By whom?... It should be done by management.

—Again, It is not Education First, but Action by management first —I pointed out firmly—. And now, you mistook already in the second step: "3. TPM promotion organization and staff organization model".

### 3) TPM promotion organization and staff organization model

—Anyway, the main actors are Gemba's Operators and Maintenance Technicians. And, here, it is necessary to consider and make up the 3 elements which are Gemba, Management, and System.

#### 4) Establish basic TPM policy and Goals.

—Actually, I mistook the order of the description. In this way, if I present his material in faithful translation. The order is:

4. Establish basic TPM policy and Goals.
3. TPM promotion organization and staff organization model. And,
5. TPM deployment master plan.

—Ha, Ha, Ha. It was just my simple mistake —I remarked—. It was just my simple mistake. But, don't you think the total order is a little strange... Why is "5. TPM Deployment Master Plan" the 5<sup>th</sup> step?

—I somewhere I wrote the issue of Policy Control<sup>15</sup>. And, What is the relation of Middle term Policy, Corporate Vision, Strategy as your company. If I say the order, this "5. TPM deployment master plan (3 years master plan, Yearly base action plan) should be the first step, which should be related to your Middle term Policy, Corporate Vision, Strategy (if you have these). In this way, I haven't seen your Policy Statement in the factory. I saw something like corporate philosophy at the entrance in a picture frame in the reception and factory.

—The steps order is completely wrong. And, if you made the thinking about the 5<sup>th</sup>: "5. TPM Deployment Master Plan" in the first step, you could find the misrelation with corporate middle term policy and strategy. And you might have been able to avoid the half-year waste of time.

#### 5) TPM deployment master plan.

—Your master plan wasn't implemented and disappeared. Why?... As I told you, any method of "T" of Total, requires 3 elements which are Gemba, Management, and System. To provide these three essentials, the First step (**Step of Introduction, Preparation**) is completely no effective and, it has almost no meaning.

### Step of Introduction.

#### 7) TPM Kick-off.

### Step of Introduction Implementation.

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<sup>15</sup> **The System of Excellence** (The Factory Management Encyclopedia, Vol. I) Factory Management Institute: <https://www.amazon.com/dp/B077SGKSB1>  
**El Sistema de la Excelencia** (Enciclopedia de Gestión de Fábrica, Vol. I) Factory Management Institute: <https://www.amazon.com/dp/B0744PTWF4>



**7) Establish a system of Effective production department.**

**7.1) Individual (Kobetsu) Kaizen.**

**7.2) Autonomous maintenance.**

**7.3) Planned preventive maintenance.**

**7.4) Education and Training.**

**8) Establish Development & Management system of Products and Equipment.****9) Establish a Quality maintenance system.****10) Establish a System of effective administration and indirect departments.****11) Establish a Control system of health & safety and environment.**

...I omit 7 to 11 items because almost I explained in the 8 Pillars.

**Step of fixing.****12) Implement TPM fully and level up.**

I also omit this explanation.

—Everyone, I have explained that it is not meant for you to follow this step. But please, never misunderstand. I don't say that these items are not necessary. However, it is quite clear that it is impossible to implement these steps by you and the order is completely wrong, even though you try to do it.

—I finish my presentation. And if you have a doubt and questions, please tell me. OK?... Everyone OK? —I finished—. Thank you, Chairperson. Please continue the next agenda.

—Oh, just a wait —I told them—. The relation of a consultant and the employer is like a Three-legged race. But as you feel, our relation is not so. I forgot to inform you the main thing —I pointed out—. I believe you accepted my activity and the result. Then. I will finish the contract and withdraw from your company.

This story is to be continued...

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## IV. The prologue of consultancy job for the Teaching company eaching Company

When I was resting in the drawing-room after the teaching in a company, I got the visitors who were guided by this company's president. The visitors were the managing director and 2 directors. The managing director (who was the friend of this company's president) introduced himself and the directors. This was the first encounter with the (Teaching) company. And there were circumstances, I accepted the consultancy job.

I omit the details of that conversation but, my first impression was that they were very enthusiastic. And, after the factory tour, we made the first meeting.

—Everyone, thank you very much for your kind factory tour. It was very impressive —I told them.

And, indeed It was indeed impressive, because of the so high-cost enterprise constitution, and what is the theme of consultancy?... It is, as usual, I wish to confirm the consultancy subject and your managerial subject.

—Mr. Kimura —the Accountant Manager tell me—. Please help us to complete the Total Productive Maintenance or Management. As I told you yesterday in your hotel, we had a deadlock to proceed with it. We desire to complete the introduction of, for instance, the 8 Pillars of TPM.

—8 Pillars of TPM? —I asked—. Again everyone, please let me know what is your subject?... Why do you wish 8 Pillars of TPM?

—Mr. Kimura —the Accountan Manager said—, we have a serious subject which is given by our president. And, it is profit recovery with cost reduction. When looking some years, our business was profitable. But recently it was turned to red. Of course, we took several actions. But the result is bad and becoming worse.

—Please wait —I pointed out—. I think you mistake the setting up of the subject.

—No, we don't mistake the setting of the subject —Other Director said—. We aim to recover the profit and to respond to our president.

I thought that this company has a very poor ability for agenda-setting. But it is not limited to this company. However, this company was too poor. —Please wait. I wish to confirm the subject. For instance, there is the word "Going Concern".

—Going concern —I remarked—. It is the basic proposition as an enterprise. Yes? — I asked knowing they didn't know this word.



### **Going Concern<sup>16</sup>... According to Wikipedia**

*A going concern is a business that is assumed will meet its financial obligations when they fall due.*

*... I omit.*

*Hence, a declaration of "going concern" means that the business has neither the intention nor the need to liquidate or to materially curtail the scale of its operations.*

*Therefore, for instance, "a going concern" is recognized as "A company that is doing well".*

—Your company is not going well, because you are not doing well. I think that you have a very poor ability for agenda-setting. Sorry, very straight word. But I need to confirm the consultancy agenda.

The Managers became tired of it, but I remarked —Why do you wish to introduce a new system or think such as TPM?

—Again —Production Manager pointed out—, we have the task of profit recovery throughout TPM activity.

—This conversation is very important for future activities —I tell them—. You spent a half year from the start. But had a deadlock. Why?... I looked around your factory and almost I could understand the situation which is a too high-cost constitution. In Europa, there is the word "A house built on sand". And in Japan exist also a similar word which is: "No house stands on a rotten foundation".

Sorry, this is a lie. There is no such word in Japan. It is my myth in the meeting. This word shows that a foundation becomes old and rotten in the aging. The business foundation has well become old in the surrounding business circumstances. And, it is not possible to build a new system or method on the traditional or rotten foundation.

—Also, now the thing that you are required to do is to deny the old rotten foundation (corporate constitution), but not to build a new system or method on it. I understand —I told them—, that it is difficult for you to deny current your managerial foundation. But you need to do this.

—Why couldn't you introduce the 8 Pillars of TPM?... Why did you fall from surplus to deficit?... Again, the word "going concern". The business circumstances are changing. Therefore, this word requires the enterprise's change. I cannot imagine that it is possible to establish a new system based on the 8 Pillars TPM in your current corporate situation.

—We are doing well and trying to do it well —The managers said.

—Please, calm down everyone —I asked them—. **Denying & reviewing current.**

—And based on these you need to make agenda setting-up. I cannot think that you took this step. Probably, the introduction of JIPM's TPM is just an idea.

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<sup>16</sup> Going Concern: [https://en.wikipedia.org/wiki/Going\\_concern](https://en.wikipedia.org/wiki/Going_concern)  
 Empresa en funcionamiento: [https://es.wikipedia.org/wiki/Empresa\\_en\\_funcionamiento](https://es.wikipedia.org/wiki/Empresa_en_funcionamiento)

—A normal level company does it when challenging to a new thing. But I can understand at a glance that your corporate level is quite low. And I can imagine why you had the deadlock of the introduction.

—Again —I remarked—, why fell from surplus to deficit?... Probably, even though the surrounding business circumstance was changing, but you couldn't follow your managerial level to it.

—Again —I insisted—, what is your agenda-setting?... Please consider this (agenda-setting) by total business circumstances.

One director, as if he was getting tired expressed —OK. Mr. Kimura. We will inform you whether we hire you or not as soon as possible.

—Oh, thank you and please. But please accept that I also have a right to refuse your proposal—and even though I continued—Today, I suggested 2 important things which are: The order of agenda-setting. The steps are "Denying & Reviewing" and deciding the theme. Secondly, I suggested the Japanese proverb which is "No house stands on a rotten foundation" — Telling myself again, there is no such proverb.

2 days later (before the day of going back to Japan), the receptionist informed me of the 2 visitors who were directors of Accounting Manager and General Affairs.

—Our company decided to ask you for your consultancy —Accountant Manager informed—. Please help us. The theme is TPM introduction and establishment.

—I cannot receive your proposal. I cannot receive your request. Because your desire is the profit recovery. And, I cannot imagine the relation of 8 Pillars TPM which is to pursue the efficiency from the point of view of machine & equipment...

—Please understand that there is no effect or relation to your purpose, even if improving machine efficiency. It is indeed that TPM is effective to just material scrap reduction. However, it is not possible to be the essential solution to your theme. Why do you persist to TPM? —I asked finally.

—It is the order of our President —the Accountant Manager exposed—. We (directors) and the president is concerned about the influence of interruption of current activity. We have already started the business of TPM introduction, even though we had a very difficult deadlock. Moreover, it is the strict order of the president.

After some other conversations I finally admitted —OK, I accept your proposal. But there are 2 conditions Which are: Firstly, I teach Total Preventive Maintenance with the process of PM (Preventive Maintenance) establishment and in parallel "All people's participation" to establish the "Total" which the meaning of companywide. Therefore, I don't follow your one of insistence (Nakajima's 12 steps). And secondly, it is that even if establishing TPM, there is minor effect to the profit recovery. I could understand the illness of your company at the factory tour at glance. Please record my condition to the contract.

Then, The General Affairs manager brought the revised contract on the same day. But only one condition, which was Total Preventive Maintenance establishment was recorded. And the 2<sup>nd</sup> one was ignored. Even though, I signed in the contract. My determination was that I establish the essential base for the future companywide activity of this company, even if the support of this time cannot be affected to their theme (profit recovery) directly.

As I wrote, when I joined this company, I was asked to lead a project team.

The aim of the team was to find the solution of Profit Recovery through the introduction activity of Total Productive Maintenance. Yes. This project was required 2 things, which were to proceed with TPM (which had the deadlock at that time) and Cost Reduction.

And when I joined and started my job, I required the reunion of the project team. Fortunately (or unfortunately) previous project team was in a deadlock and was in the timing of revise, because of already more than a half year past.

And I required managers to choose new project team members.



### ***The constitution of members (From TPM-8<sup>17</sup>) and proposition.***

*Accounting:1, HR:1, Design Engineering:1, Production Engineering:1, Production planning:1, General affairs:1, Material control:1, QA:1, Sales:1, Maintenance:1, Gemba supervisor:1. Total 11 members.*

*And the Proposition was:*

- 1) Cost reduction in the production process.*
- 2) Improvement of the corporate constitution.*
- 3) TPM introduction (as the means of above propositions)*

*(Above proposition was decided in the meeting of me and directors before the project re-constitution.)*

*And when I made the first meeting with this team, I required them to make a slogan.*

*I told them that your Managing Director requires you an innovation.*

*(When I met him in my hotel, he solicited and used the word of corporate innovation)*

*And We made 2 slogans.*

- 1) One is "Let's innovate our company".*
- 2) Another one was: "Let's establish JIT Machine condition" and Let's change the corporate culture.*

*These slogans also were welcomed by (ignorant) managers.*

*Actually yes, I sneaked 3 essential words in. Which are "Innovation" and "JIT" and corporate culture change.*



### ***Corporate culture***

*When I joined this company, I felt a strange feeling. Probably, it is the cause of the divided collaboration between the organizations. It is indeed that the bigger organization, the more phenomenon of division. But this company was special. Normally, a company makes effort to unite employees' minds to the company's direction. And it is necessary to show the policy,*

<sup>17</sup> TMP-8 (English): <https://archive.org/details/tpm8preventionofscatering>  
 TPM-8 (Spanish): <https://archive.org/details/tpm8prevenciondeladisersion>

*strategy, and corporate philosophy, president's direct talk, bulletin, visualization of information. But this company had the lacks. And indirect departments didn't show the intention to support production Gemba sufficiently. And also, the production Gemba had a serious division. The minds of assembly workers and machine operators were clearly different ways. Anyway, this company's corporate behavior style (or corporate culture) had a serious disease.*

### **Corporate Behaviour Style (Britannica International Encyclopedia)**

*Behavioral styles and styles shared by people in the enterprise. Each company has unique characteristics regarding the method of decision making, the method of communication, the method of contact between the top and bottom, the method of collaboration, and the method of persuasion. Corporate culture is an important clue to the invisible corporate culture as a company's values, beliefs, and norms.*

### **Corporate culture**

*Also known as a corporate behavior style. According to GH Ritwin and RA Stringer's book *Organizational Climate*, "people who live and work in the work environment perceive directly or indirectly and influence their motivation and behavior". Measurable characteristics of a series of work environments". It is a psychological environmental factor from the perspective of the members of the organization, and it is also a factor that affects the satisfaction and motivation of each person. It is a concept in micro-organization theory and is distinguished from the terms "corporate culture" and "organizational culture" that indicate organizational attributes that exist beyond the attributes of individual members.*

## **V. Next Lecture**

I write Cost Reduction-4 and Oil control-5 (final).

At this time, I couldn't write the Oil-control-5, due to the time constraint. Then, I write this and will finish the description of Total Preventive Maintenance.

**Koichi Kimura CC4 – November-2021.**

**Factory Management Institute**